I.1
9/30/94

PRP REMOVAL REPORT
FOR
COLUMBUS SCRAP SITE
COLUMBUS, FRANKLIN COUNTY, OHIO
TDD: T05-9210-022
PAN: EOHO938RBA
DOCUMENT CONTROL NUMBER: TAT-05-23-04027

September 30, 1994

Prepared for:

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Emergency Support Section
U.S. EPA - REGION V

Contract Number: 68-WO-0037

Prepared by: NazeesUddin Date: 9/30/94
Reviewed by: Nazees Uddin for Karen Spangler Date: 9/30/94
Approved by: Allen A. Burt Date: 9.30.94

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International Specialists in the Environment

TABLE OF CONTENTS

LIST OF FIGURES

1.0 INTRODUCTION

The Ecology & Environment, Inc., (E & E) Technical Assistance Team (TAT) was tasked by the United States Environmental Protection Agency (U.S. EPA) to conduct oversight of Potentially Responsible Party (PRP) removal operations at the Columbus Scrap (CS) site, Franklin County, Columbus, Ohio, under Technical Directive Document (TDD) T05-9210-022 issued on October 14, 1992. Tasks to be completed under this TDD included reviewing the PRP's bioremediation work plan and site health and safety plan, conducting treatability study sampling, maintaining site files, overseeing site safety, providing photo/video documentation and verbal briefings to the On-Scene Coordinator (OSC) Steve Renninger.

2.0 SITE BACKGROUND

2.1 Description

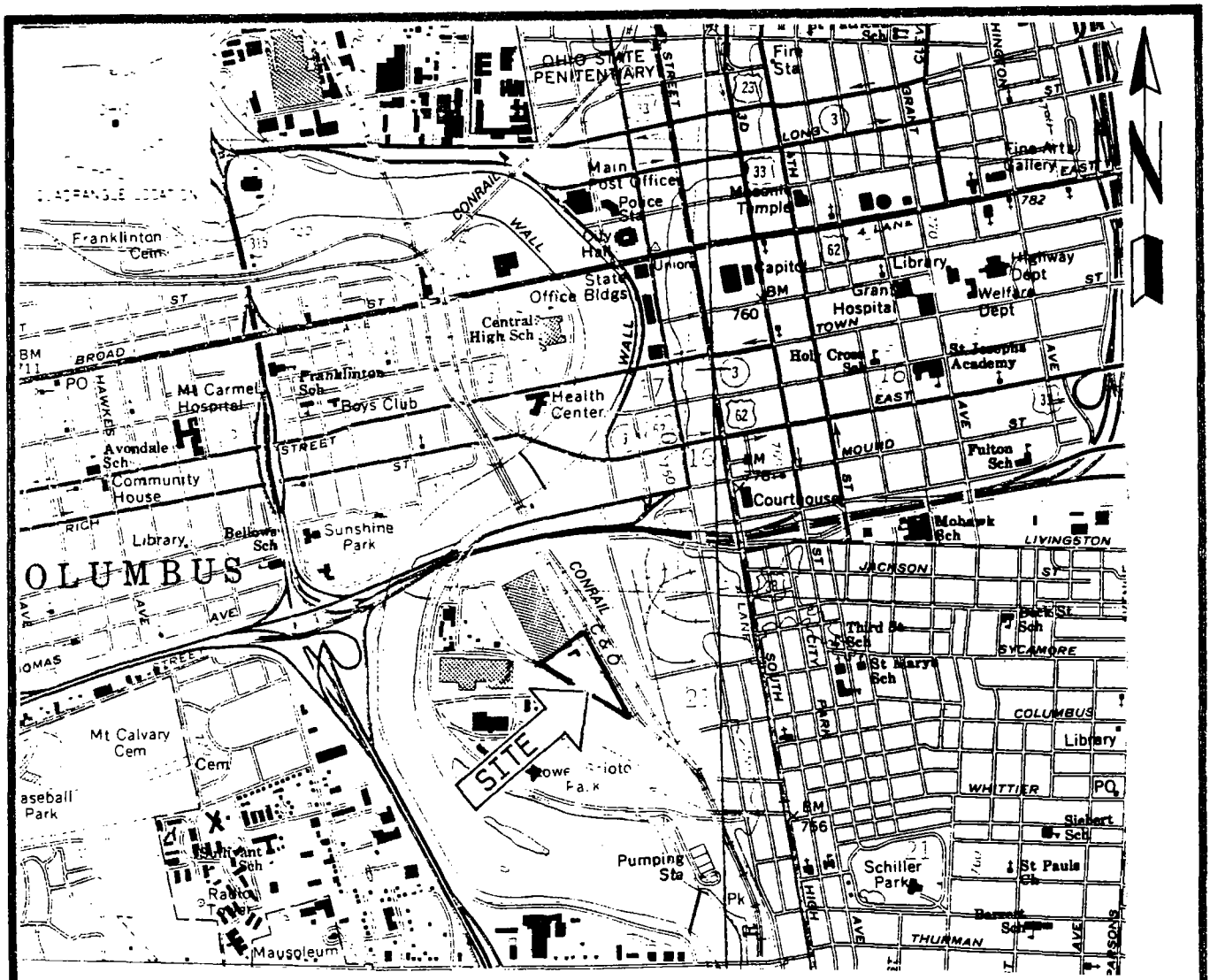
The CS site is located at 580 Furnace Street, Columbus, Franklin County, Ohio. This site consists of an active operational 6.5 acre commercial scrap yard (Figure 1). The site is a triangular parcel of land bounded on the northeast by railroad tracks. There are railroad tracks also located on the southwest of the site. An industrial area is located on the northwest of the site and an open field on the south. An office building, a locker room, buildings housing the bailer and shears, and scrap piles are located on the site (Figure 2).

The topography of the land is generally flat. The surface of the site is largely covered with scrap metal. Two rail spurs traverse the long axis of the site. Rail-mounted cranes and open railroad cars operate along these tracks to access and move inventory. Vegetation at the site consists of bushes and weeds and is primarily restricted to the site perimeter.

2.2 Site Geology

The CS site is located on the alluvial plain of the Scioto River on sediments that are overlying the Devonian bedrock. This alluvium could be expected to be poorly sorted and poorly bedded silt and sand, generally less than 25 feet (ft) thick. Individual layers are thin, lenticular, and nearly horizontal. This includes all detrital material deposited in valleys or undrained depressions since the last glacier.

The groundwater at the CS site may be obtained from Devonian and Silurian limestone at yields up to 175 gallons per minute to the west of the site. Groundwater is available in lenses of sand and gravel interbedded in clayey till overlying shale bedrock.



Source USGS Southwest Columbus, Ohio
& Southeast Columbus, Ohio
1964 Photorevised 1985
Quad. 7.5 Minute Series
Scale 1:24000

FIGURE 1
SITE LOCATION MAP
COLUMBUS SCRAP SITE
COLUMBUS, FRANKLIN COUNTY, OHIO

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APPROVED BY A. BUSHER	DATE 06/17/94	TDD # T05-9210-022

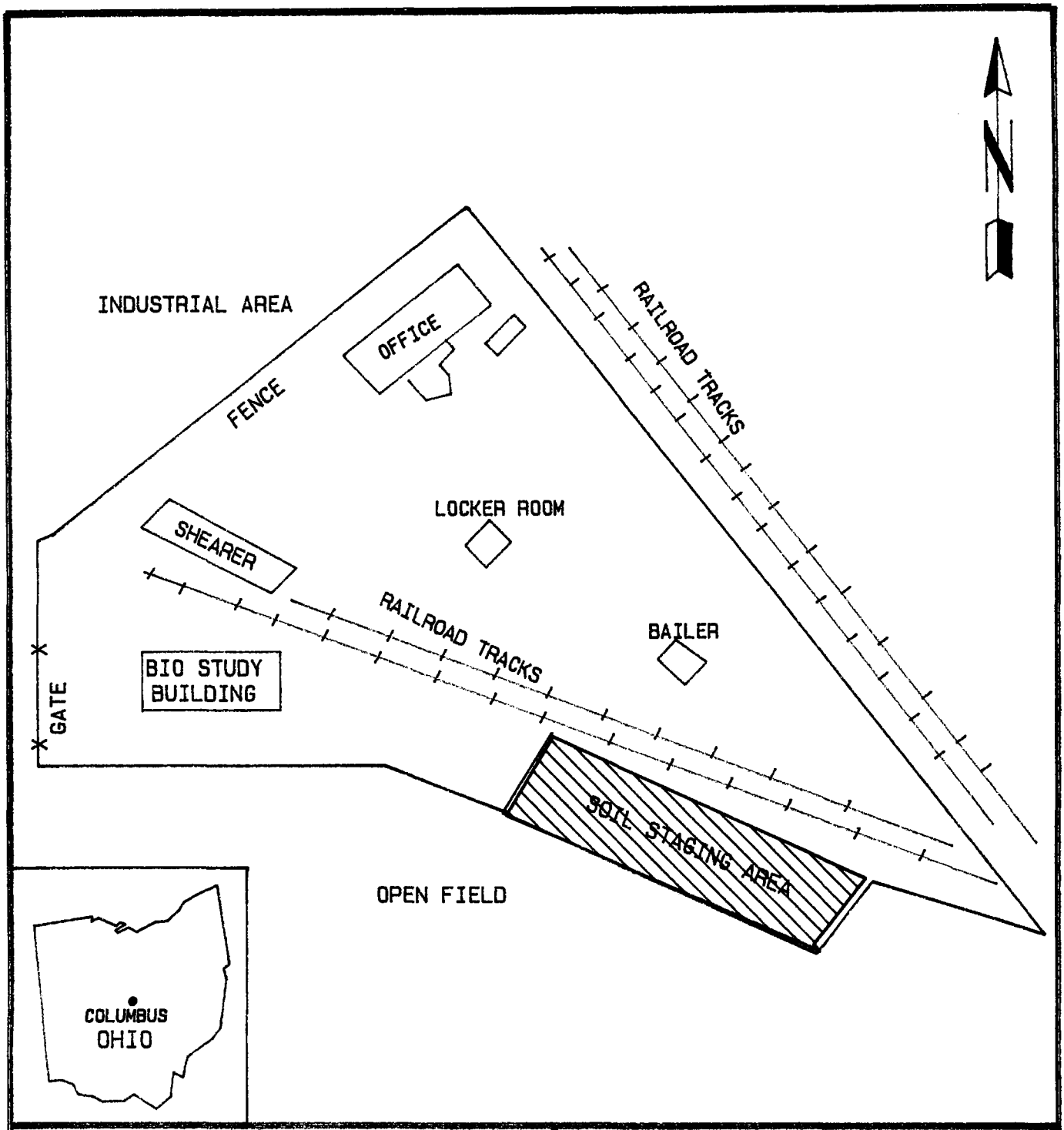

FIGURE 2

SITE FEATURES

COLUMBUS SCRAP SITE

COLUMBUS, FRANKLIN COUNTY, OHIO

NOT TO SCALE

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APPROVED BY A. Busher	DATE 09/15/94	TDD # T05-9210-022

To the south of the site, extensive sand and gravel deposits may yield up to 500 or 1,000 gallons per minute (Ohio Department of Natural Resources, 1958).

The majority of the population within Columbus city limits relies on municipal water supplies taken from a well field south of the city. The population outside the municipal water system boundaries uses private wells. There are approximately 280 homes within a range of four miles of the site which are using private wells for drinking water. The nearest residential drinking well is approximately 1.5 miles to the southwest of the site. Depths of the residential wells range from 27 to 64 ft with static water levels mostly less than 10 feet. These wells are set in a limestone layer at a depth of 11 to 20 ft below the ground surface (Ohio Environmental Protection Agency, 1992).

2.3 Site History

The CS site is utilized for scrap shredding, storage, and recycling of scrap metals. The CS property is owned by CSX Transportation (CSXT) and has been leased to Columbus Scrap since July 1985. In May 1989, polychlorinated biphenyl (PCB) contaminated capacitors were discovered by the OEPA in a roll-off box owned by CS and used by a local equipment rebuilder.

On May 25, 1989, the OEPA was authorized by U.S. EPA under the Toxic Substances Control Act (TSCA), Section to conduct a site inspection of the CS property and to monitor compliance with federal regulations governing the handling and disposal of PCB waste. Eight electrical capacitors were observed during the OEPA site inspection, one of which contained PCBs. A soil sample collected by OEPA during the site inspection indicated the presence of PCBs at levels of 1,000 mg/kg.

In June 1989, Chemical Waste Management, Inc., (CWM) a contractor for the two PRPs, CSXT and Columbus Scrap, initiated the removal of eight capacitors and excavated the surrounding soils for disposal. The PRP contractor collected confirmatory surface soil samples from the excavated areas and the results indicated the presence of PCBs at 110,000 mg/Kg. Therefore, the U.S. EPA required the completion of more extensive soil sampling to be conducted over the entire facility to determine the extent of PCB contamination.

On July 27, 1990, Kemron Environmental Services (Kemron), another contractor for the PRPs and U.S. EPA previous TAT contractor, Roy F. Weston conducted a site investigation and sampling at the CS site. Ten surface soil samples were collected by TAT for PCB analysis. The TAT results indicated the presence of PCBs (260 mg/kg) in the site soils which exceeds the established TSCA clean up level of 25 mg/kg as defined in 40 CFR Subpart G, Section 761.120, paragraph (c) (3): "Requirements for

decontaminating spills in other restricted access areas.....Soil contaminated by the spill will be cleaned to 25 ppm PCBs by weight".

On April 10, 1991, the U.S. EPA signed an Administrative Order by Consent (AOC) with the two site PRPs, Columbus Scrap and CSX Transportation, requiring them to conduct an extent of contamination study and soil remediation of the 6.5 acre scrap yard. On June 10, 1991, U.S. EPA OSC Steve Renninger approved the PRP site characterization work plan prepared by the PRP contractor to address initial sampling, sector sampling, depth profiling, and restricting site access.

On June 17, 1991, U.S. EPA OSC Steven Renninger, TAT (E & E) members conducted a site inspection and collected soil samples at the CS site. At the time of the site assessment, the PRP contractor collected a total of 85 composite surface soil samples from the site for the extent of contamination study. The OSC, TAT and the PRP contractor located the sample points by marking off 80 ft by 80 ft sectors. Five samples were collected from each sector. The TAT collected 12 split soil samples for PCB analyses. The results of TAT and the PRP contractor soil samples indicated the presence of PCBs at levels of 50 mg/kg. Therefore, the CS site was determined by OSC Renninger to be a threat to the environment and public health. These findings and sampling activities were documented in detail in the Site Assessment Report submitted by the TAT to U.S. EPA under TDD T05-9106-001 on September 25, 1991.

On February 21, 1992, site activities were completed by the PRP contractor under the site characterization work plan, which included a professional survey of the site, delineation of potentially contaminated areas, sector sampling, depth profiling and construction of a fence around the site and adjacent property. The PRP contractor excavated up to 4 ft of soil in the contaminated areas on-site. Approximately 16,000 cubic yards (yd^3) of PCB contaminated soil was piled in the on-site staging area for bioremediation. Completion of these activities by the PRP contractor was documented in the Site Assessment Report submitted by the TAT to U.S. EPA under TDD T05-9106-001 on September 25, 1991.

3.0 SITE ACTIVITIES

On October 30, 1992, a work plan for a bioremediation treatability study of the PCB contaminated soils was prepared by the PRP contractor in accordance with the AOC. The work plan was approved by U.S. EPA on November 17, 1992. The work plan was also reviewed by TAT. The work plan required that the PRP contractor to initiate a 20 week bench scale on-site treatability study to demonstrate suitability of a full scale bioremediation

of PCBs in on-site soils. A comprehensive sampling strategy for the treatability study was proposed by TAT.

From January 14, 1993 through June 25, 1993, a treatability study was conducted at the CS site by the PRP contractor. During this study TAT and the PRP contractor collected bioremediation study soil samples. Detailed information of the sampling is presented in section 4.0. The objective of this study was to determine the effectiveness of the use of a fungal treatment to degrade the PCBs in six test plots. The results of the test would provide critical information for a full scale treatment of the approximately 16,000 yd^3 of PCB contaminated soils excavated from the CS site and stock piled in the soil staging area. The 20 week on-site treatability study was completed with the submission of the Treatability Study Report by the PRP contractor to U.S. EPA on July 30, 1993. Photographs of the CS site are provided in Appendix A.

3.1 Technology Description

Biodegradation of PCBs in the soil of the on-site test plots was tested by adding exogenous microbes to the PCB contaminated soils. The organism used for the PCB degradation was Phanerochaete chrysosporium, a member of the group of fungi known as white rot fungi. These fungi are normal soil inhabitants and generally degrade the brown lignin component of wood leaving behind the white cellulose component. Although the fungi are not capable of recognizing or utilizing PCBs, the enzymes that they produce to degrade lignin are non-specific and have been shown to degrade PCBs and a wide range of other contaminants (Kemron, 1992).

To utilize the white rot fungi for PCB bioremediation, the fungi was grown in cultures on the wood chips and then applied to a mixture of the contaminated soil. The fungi used the wood chips as their major nutrient source and substrate for growth and only required the addition of water and soil. When a population of fungi completely impregnated the wood chip substrate, a layer of chips was spread over the contaminated soil and mixed with surface soil. Soil watering provided sufficient moisture (40%) for continued growth of the fungi. The non-specific exogenous enzymes produced by the fungi to degrade the wood substrate were carried into the soil by seeping water, degrading PCBs when encountered (Kemron, 1992).

3.2 Treatments and Experimental Design

At the CS site, treatments consisted of the addition of the fungus to test plots of soil. The test soil for this study was collected from numerous randomly selected areas of the 16,000 yd^3 of PCB contaminated soil pile located in the staging area (Figure 2). A total volume of approximately 25 yd^3 of soil was obtained

from the contaminated soil pile at various depths using a backhoe and was screened through a 3 inch mesh screen onto a layer of polyethylene tarp in the soil mixing area. The soil was then homogenized by mixing it with a front-end loader bucket and placed into the six different plots.

A steel tube arch frame building covered with a polyester fabric with dimensions of 20 ft by 50 ft with a 17 ft high ceiling was constructed over the test plots.

The experimental design consisted of six test plots. One unamended control plot (CP) with dimensions of 5 ft X 5 ft X 1 ft consisted of soil to which no fungi or wood chips were added and tilled weekly (Figure 3). One amended control plot (TP-5) with dimension of 10 ft X 14 ft X 4 ft consisted of soil amended with uninoculated wood chips. Another four amended test plots had the dimensions of 10 ft x 10 ft X 1 ft. A schedule of addition of inoculated and uninoculated wood chips and tilling was established for each test plot. Additions and tilling were initiated at the beginning of the test (Time 0) and maintained through out the schedule until week 20 of the test (Table 1).

Four test plots were designed as follows: Test Plot 1 (TP-1) soil amended at time 0 and week 2 with uninoculated wood chips and tilled weekly; TP-2 soil amended at time 0 and week 2 with wood chips inoculated with fungus and tilled weekly; TP-3 soil amended at time 0 and week 2 with wood chips inoculated with fungus and tilled at time 0 only; and TP-4 soil amended at time 0 and week 2 with wood chips inoculated with fungus and tilled at time 0 and week 2, untilled until week 10 at which time another inoculum was applied and tilled and then remained untilled for the remainder of the test. TP-5 was amended at time 0 and week 2 with wood chips, inoculated with fungus and tilled at time 0 and week 2 only (Kemron, 1992).

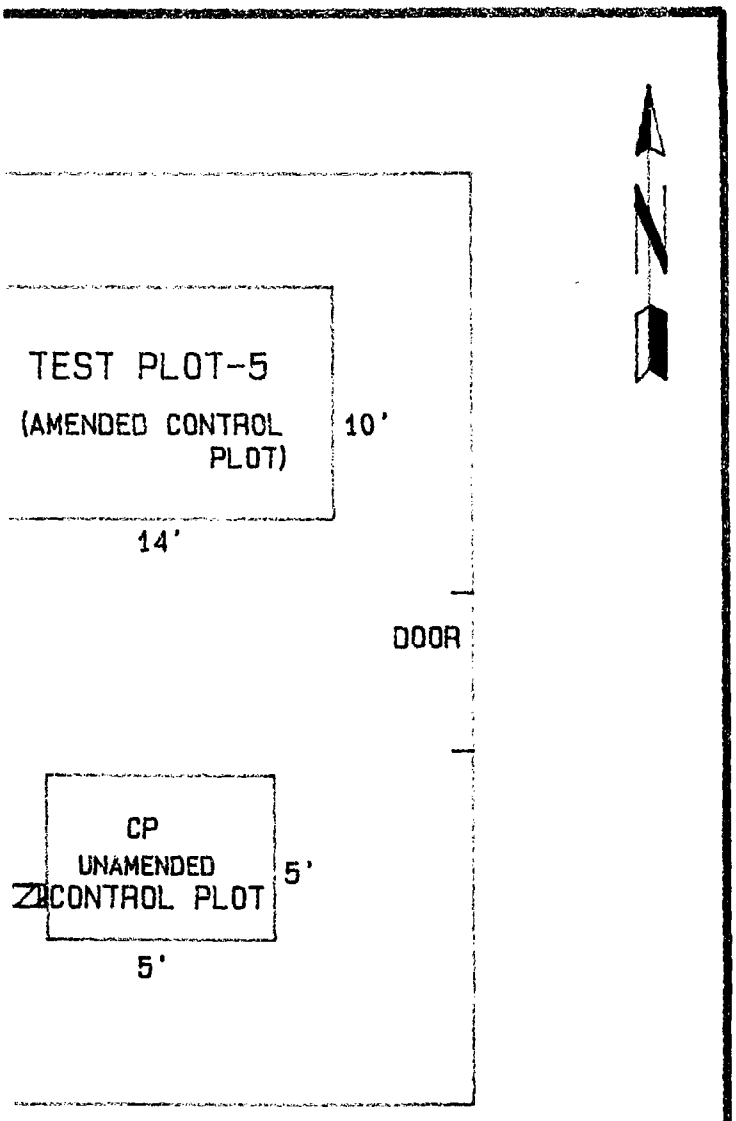
3.3 Waste Applicability

This type of fungal treatment has been tested for treatment of soils contaminated with organic compounds such as PCBs. Warm temperatures (greater than 80 degrees Fahrenheit) and sufficient moisture (40%) in the target matrix are desirable for the optimal growth of the fungus and thus, for the degradation of the PCBs.

3.4 Test Plot and Soil Pile Maintenance

Each soil plot was monitored weekly for soil moisture holding capacity and adjusted as required to maintain approximately 40% moisture holding capacity. When necessary water was applied manually using a garden hose and nozzle.

The test plots were tilled by hand with a shovel as per the schedule. When samples were to be taken, tilling was performed



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DATE 09- 15 - 94	TDD # T05-9210-022

TABLE 1
WOOD CHIP ADDITION AND TREATMENT SCHEDULE

TEST PLOT	*WOOD CHIP ADDITION*	*TILLING*
TP-1	UNINOCULATED TIME 0 & WEEK 2	WEEKLY
TP-2	TIME 0 & WEEK 2	WEEKLY
TP-3	TIME 0 & WEEK 2	AFTER TIME 0 ADDITION ONLY
TP-4	TIME 0, WEEKS 2, 10	AFTER TIME 0, WEEKS 2 & 10
TP-5	TIME 0 & WEEK 2	AFTER TIME 0, WEEKS 2 & 10
CP	NONE	WEEKLY

NOTES
TP-TEST PLOT
CP-CONTROL PLOT

first, then the samples were taken and the soil surface was restored to a level grade.

4.0 SAMPLING ACTIVITIES

From January 14 through June 25, 1993, the TAT collected 22 soil grab samples from the CS treatability study test plots at locations randomly selected by OSC Renninger (Table 2). The TAT also accepted 33 split composite soil samples from the PRP contractor during the duration of the treatability study. All soil samples were collected to assess the biodegradation of PCBs. The soil sample locations and frequency of sampling were selected by OSC Renninger during the initial stages of the treatability study of the PCB contaminated soil (Figure 4).

4.1 Sampling Procedures

Prior to sampling, the soil in each plot was tilled if it was scheduled for tilling to a depth of approximately 10 inches. Ten grab samples were taken randomly from each plot and composited into one sample. Split samples of the soil were provided to TAT by the PRP contractor as per TAT's request. The samples were collected with a stainless steel trowel, placed into a mixing pan, and mixed until homogeneous. The material was then transferred into labeled sample bottles. The samples were cooled to approximately 4 degrees Celsius and shipped to the laboratory.

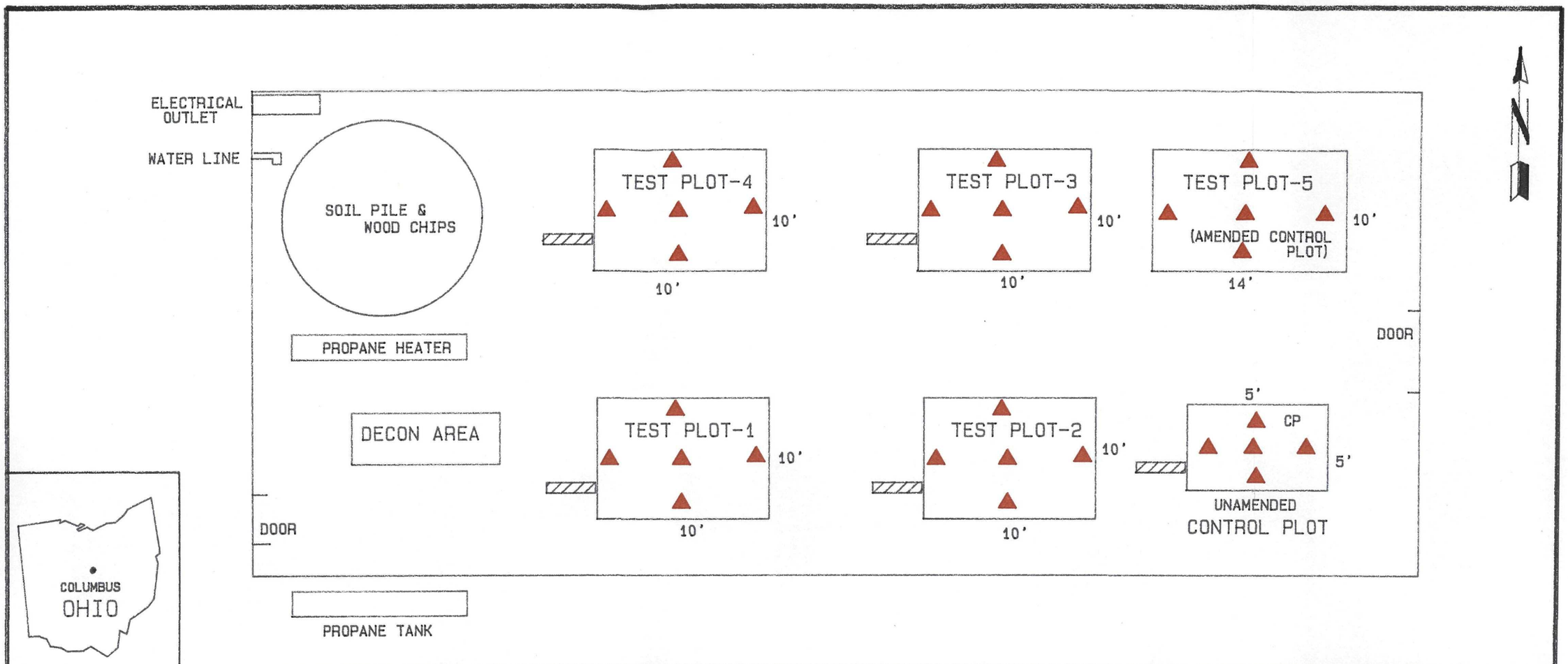
Prior to collection of any samples, all sampling equipment was decontaminated using the decontamination procedures. The procedures included the scrubbing of all equipment (eg. trowel and shovel) with a decontamination solution of detergent (Alconox) and distilled water and triple rinsing the equipment with distilled water.

The samples were sent to three different laboratories and were analyzed for PCBs (EPA Method 8080, SW846): American Analytical Laboratories, Akron, Ohio, under analytical TDD number T05-9302-804 on February 3, 1993; Ross Analytical Services, Strongsville, Ohio, under analytical TDD T05-9305-815 on May 28, 1993; and Electro-Analytical Laboratories, Mentor, Ohio, under analytical TDD T05-9303-812 on March 26, 1993. Each set of the laboratory results were received by fax within the seven days as requested in the TDD. The hard copy data validation package was received within 21 days as required (Appendix B). The lab results obtained by the TAT and the PRP contractor will be discussed in detail in section 5.0 of this report. Tables of the analytical results from the samples collected by the TAT and the PRP contractor are presented in Appendix C.

TABLE 2
SAMPLING SCHEME FOR TREATABILITY STUDY
COLUMBUS SCRAP SITE

TEST PLOT NUMBERS	*WEEKS KEMRON COLLECTED SAMPLES*	*WEEKS TAT COLLECTED* SAMPLES FOR ANALYSIS	*WEEKS TAT COLLECTED SAMPLES FOR HOLD*
TP – 1	TIME 0, WEEKS 2, 6, 10, 12, 14, 16, 18, & 20	TIME 0, WEEK 16	WEEKS 6 AND 20
TP – 2	TIME 0, WEEKS 2, 6, 10, 12, 14, 16, 18, & 20	TIME 0, WEEKS 6 AND 16	WEEKS 2, 12, 14 & 20
TP – 3	TIME 0, WEEKS 2, 6, 10, 12, 14, 16, 18, & 20	TIME 0, WEEKS 6, 16, AND 20	WEEKS 10, 12, & 20
TP – 4	TIME 0, WEEKS 2, 6, 10, 12, 14, 16, 18, & 20	TIME 0, WEEKS 16, & 20	WEEKS 6, 18, & 20
TP – 5	TIME 0, WEEKS 2, 6, 10, 12, 14, 16, 18, & 20	NA	TIME 0, WEEKS 16, & 20
CP	TIME 0, WEEKS 2, 6, 10, 12, 14, 16, 18, AND 20	TIME 0, WEEK 20	WEEKS 16, & 20

NOTES
TP–TEST PLOT
CP–CONTROL PLOT



LEGEND

TEST PLOT

TAT & PRP SOIL SAMPLE LOCATION

LEACHATE COLLECTION BASIN

NOT TO SCALE

FIGURE 4
SOIL SAMPLING LOCATION MAP
COLUMBUS SCRAP
COLUMBUS
FRANKLIN COUNTY, OHIO

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APPROVED BY A. BUSHER	DATE 09 - 15 - 94	TDD # T05-9210-022

5.0 TREATABILITY STUDY RESULTS

Over a 20-week period, from February 3 through June 25, 1993, the fungal treatment was tested under simulated field conditions. Soil samples from each of the test plots were collected at the beginning (Time 0) of the study, and then at the end of the 2nd, 6th, 10th, 12th, 14th, 16th, 18th and 20th weeks of the study (Table B).

The results from samples collected by TAT indicated that no significant biodegradation of PCBs had taken place in any of the test plots, unlike PRP's results. The PRP's data indicated that great variation between the TAT and the PRP contractor's analytical results may be due to various factors such as laboratory variation in analysis, variable concentration of PCBs in the soil due to the homogenization of samples. Graphs comparing the TAT and the PRP contractor data for each test plot were prepared and are included in Appendix D. Interpretation of the TAT and the PRP contractor laboratory data of the treatability studies are summarized as follows:

o The PRP laboratory data suggested that the original average concentration of PCBs present in the soil prior to the treatability study was 19.1 mg/kg based on the PRP contractor's initial concentrations for soil plots. The result of the background soil sample collected by the PRP contractor from the 16,000 yd^3 PCB contaminated soil pile in the soil staging area was 19.0 mg/kg of PCBs. The soil from the control plot had an initial PCB concentration of 23.13 mg/kg.

o Based on the average PCB concentrations for the test soils, an initial average concentration of 20 mg/kg PCBs was used for the study. The TAT laboratory data suggested that upon the completion of the treatability study TP-3 and TP-4 achieved a 42% reduction of PCBs. The PRP contractor's data suggested that TP-3 achieved a 50% to 70% reduction of PCBs depending on whether calculation used an average of the grab or a composite soil of the samples. TP-4 indicated a 77% to 93% reduction of PCBs also depending on whether calculated using averages of grab or composite soil samples (Appendix E).

o Quality Assurance/Quality Control (QA/AC) review of the PRP contractor laboratory data indicated that most of the PCB analytical results are likely to be biased due to low laboratory surrogate sample recoveries and no laboratory replicate samples analyzed. Therefore, a low reproducibility of the PRP laboratory data is indicated and the results should be treated as suspect. The relative standard deviation (RSD) values calculated by the laboratory data analyses have been moderate to high throughout the treatability study.

o According to the TAT laboratory data, PCB losses from the test plots TP-1 through TP-4 due to fungal or other activity may be approximately 42% from week 20 until Time 0 with an estimated 8% loss in PCBs due to absorption into the wood chips.

o According to the PRP contractor's data for TP-5, the concentration of PCBs at week 14 was approximately 10 mg/kg. The QA/QC RSD for the laboratory data was approximately 37%. Indicating that the data is biased and the final week 14 concentration probably occurs in a range of 6.3 to 13.7 mg/kg PCBs. This correlates to a loss of 32% to 69%. Factoring in an estimated 8% probable absorption of the PCBs by the wood chips and PCB losses due to bioremediation are perhaps in the range of 24% to 61%. The PRP's calculations assume that a bias, indicated by the low surrogate laboratory QA/QC recoveries, has not occurred. If there is a bias and values were reported low, then the percent loss of PCBs would be less than indicated. TAT and PRP data demonstrated that TP-3 performed similarly to TP-5. TP-4 may have performed slightly better, resulting in greater loss of PCBs, but it is extremely difficult to conclude this due to the uncertainty of the PRP contractor's laboratory results.

Concentrations of PCBs in the soils of CS site have been reported to be as high as 111,000 mg/kg.

The PRP contractor has not positively demonstrated that the fungal treatment reduce the PCB concentrations in the soils of the CS site to levels below the TSCA clean up level of 25 mg/kg. A large level of uncertainty is associated with the PRP contractor data due to the absence of replicate samples. Uncertainty is further increased due to the low laboratory QA/QC surrogate recoveries throughout the treatability study indicating that PCB losses may not be significant because PCB concentrations in individual samples may be greater than reported. The reported PCB concentrations for any one plot over time increase and decrease throughout the treatability study. This would indicate further uncertainty in calculating the percent losses which may have occurred (U.S. EPA Risk Reduction Engineering Laboratory 1993).

6.0 SUMMARY

From January 14, 1993 through June 25, 1993, a treatability study was conducted at the CS site by the PRP contractor. During this study TAT and the PRP contractor collected soil samples to determine the use of fungal treatment to degrade the PCB in the soil. The TAT results indicated that no significant biodegradation of PCB had taken place in test plots. There is great variation in the analytical results of TAT and the PRP contractor which may be due to various factors. However the PRP

contractor had not positively demonstrated that the fungal treatment significantly reduced the PCBs concentrations in the soil through bioremediation to achieve the TSCA clean up level of 25 mg/kg.

On December 8, 1993, the PRP contractor suggested a proposal for a full scale bioremediation for soil with concentrations less than 100 mg/kg of PCBs. The soil with concentrations of 100 mg/kg or more of PCBs will be disposed off site (Appendix F). The U.S. EPA is evaluating the PRP contractor's proposal for full scale bioremediation.

7.0 REFERENCES

ODNR, 1958, The Ground Water Resources of Franklin County, Ohio and the Approximate Contours on the Bedrock Surfaces.

OEPA, January 30, 1992, Preliminary Assessment Report, for Columbus Scrap, prepared by Jeffrey W. Reynolds, Division of Emergency and Remedial Response, OEPA.

Kemron Environmental Services (KES), October 30, 1992, Work Plan Treatability Test for Remediation of PCB-Contaminated Soils, prepared for Columbus Scrap site, Columbus, Ohio.

Kreiton, Kim Lisa, August 2, 1993, U.S. EPA, Risk Reduction Engineering Laboratory (RREL), memorandum, to Steve Renninger, OSC, U.S. EPA Region V, Westlake, Ohio.

A

APPENDIX A

PHOTOGRAPHS

SITE NAME: COLUMBUS SCRAP
DIRECTION: South
DATE: 02/19/93
TDD: T05-9210-022
PAN: EOH0938RBA
PHOTOGRAPHER: N. UDDIN
DESCRIPTION: Picture shows bioremediation samples.

SITE NAME: COLUMBUS SCRAP
DIRECTION: Northweast
DATE: 02/19/93
TDD: T05-9210-022
PAN: EOH0938RBA
PHOTOGRAPHER: N. UDDIN
DESCRIPTION: Picture shows the bioremediation test plots.

SITE NAME: COLUMBUS SCRAP
DIRECTION: East
DATE: 02/19/93
TDD: T05-9210-022
PAN: EOH0938RBA
PHOTOGRAPHER: N. UDDIN
DESCRIPTION: View showing a collection of bioremediation samples.

SITE NAME: COLUMBUS SCRAP
DIRECTION: South
DATE: 02/19/93
TDD: T05-9210-022
PAN: EOH0938RBA
PHOTOGRAPHER: N. UDDIN
DESCRIPTION: Close up view showing a collection of bioremediation samples.

SITE NAME: COLUMBUS SCRAP
DIRECTION: Southeast
DATE: 02/19/93
DESCRIPTION: Picture shows the control plot.

TDD: T05-9210-022
PAN: EOH0938RBA
PHOTOGRAPHER: N. UDDIN

SITE NAME: COLUMBUS SCRAP
DIRECTION: South
DATE: 02/19/93
DESCRIPTION: Close up view of the control test plot.

TDD: T05-9210-022
PAN: EOH0938RBA
PHOTOGRAPHER: N. UDDIN

SITE NAME: COLUMBUS SCRAP
DIRECTION: South
DATE: 02/19/93
TDD: T05-9210-022
PAN: EOH0938RBA
PHOTOGRAPHER: N. UDDIN
DESCRIPTION: Close up view of the control test plot.

SITE NAME: COLUMBUS SCRAP
DIRECTION: Northwest
DATE: 02/19/93
TDD: T05-9210-022
PAN: EOH0938RBA
PHOTOGRAPHER: N. UDDIN
DESCRIPTION: Picture shows a pile of woodchips.

SITE NAME: COLUMBUS SCRAP
DIRECTION:
DATE: 02/19/93
DESCRIPTION: Picture shows the leachate collection of a plot.

TDD: T05-9210-022
PAN: EOH0938RBA
PHOTOGRAPHER: N. UDDIN

SITE NAME: COLUMBUS SCRAP
DIRECTION: Southeast
DATE: 02/19/93
DESCRIPTION: Picture showing a test plot with liner and leachate collection.

TDD: T05-9210-022
PAN: EOH0938RBA
PHOTOGRAPHER: N. UDDIN

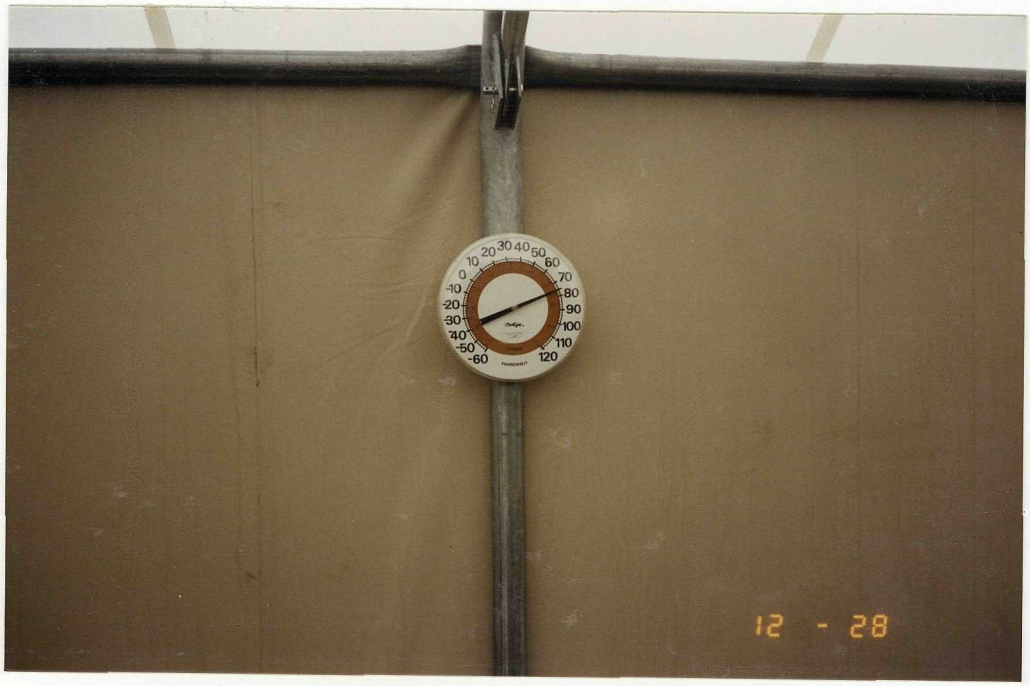
SITE NAME: COLUMBUS SCRAP
DIRECTION:
DATE: 02/19/93
DESCRIPTION: Picture showing a propane heater inside the green house.

TDD: T05-9210-022
PAN: EOH0938RBA
PHOTOGRAPHER: N. UDDIN

SITE NAME: COLUMBUS SCRAP
DIRECTION: East
DATE: 02/19/93
DESCRIPTION: View showing the pile of 16,000 cu. yads. of contaminated soil.

TDD: T05-9210-022
PAN: EOH0938RBA
PHOTOGRAPHER: N. UDDIN

SITE NAME: COLUMBUS SCRAP
DIRECTION: East
DATE: 02/19/93
TDD: T05-9210-022
PAN: EOH0938RBA
PHOTOGRAPHER: N. UDDIN
DESCRIPTION: Picture showing the bioremediation study green house.



SITE NAME: COLUMBUS SCRAP
DIRECTION:
DATE: 02/19/93
TDD: T05-9210-022
PAN: EOH0938RBA
PHOTOGRAPHER: N. UDDIN
DESCRIPTION: Picture showing 76 ^{0}F temperature inside the green house.

APPENDIX B

TAT ANALYTICAL DATA

ecology and environment, inc.

111 WEST JACKSON BLVD., CHICAGO, ILLINOIS 60604, TEL. 312-663-9415

International Specialists in the Environment

MEMORANDUM

DATE: February 15, 1993

TO: George Albertson, Project Manager, E&E, Cincinnati, OH

FROM: Emily S. Landis, TAT-Geochemist, E&E, Cleveland, OH

THRU: Anne A. Busher, ATATL, E&E, Cleveland, OH

SUBJ: **PCB Data Quality Assurance Review**, Columbus Scrap Site, Columbus, Franklin County, Ohio

REF: Project TDD: T059210022 Analytical TDD: T059302804
Project PAN: EOH0938RBA Analytical PAN: EOH0938AAA

The data quality assurance review of 6 composite soil samples taken from the Columbus Scrap site on February 3, 1993, is now complete. The samples were submitted to American Analytical Laboratories of Akron, Ohio. The laboratory analyzed the samples for polychlorinated biphenyls (PCBs) by gas chromatography with electron capture detector (GC/ECD), according to SW-846 Method 8080.

The samples were labeled TP #4, TP #3, TP #1, TP #2, CP, and #1 WC, corresponding to the laboratory's numbers 01 through 06, respectively, under their work order number 93-02-064.

Data Qualifications:

I Holding Time: Acceptable.

The samples were extracted February 4, 1993, and analyzed February 8, 1993.

II Instrument Performance: Not evaluated.

The standard chromatograms appear to have adequate peak resolution. Surrogate compound tetrachloro-m-xylene (TCMX) was added to the samples to evaluate instrument performance. Due to the high concentration of PCB in the samples, however, the surrogate was diluted out, and therefore surrogate recoveries and retention time shifts cannot be evaluated.

III Initial and Continuing Calibration: Acceptable.

Five standards each of Aroclors 1254, 1242, and 1260 were run prior to sample analysis. The percent relative standard deviation for each Aroclor's response factor (RF) was well below the 10% limit for the initial linearity check. A continuing calibration check using Aroclor 1254 was run with the sample batch. The percent difference (%D) between the initial and continuing RFs was 10%.

IV Blank: Acceptable.

All Aroclors were below the detection limit in the method blank. The surrogate %R was within the control limits.

V Compound Identification: Acceptable.

The Aroclor was identified by "fingerprint" pattern using the instrument's computer library and calibrations.

VI Compound Quantitation/Stated Detection Limits: Acceptable.

The reported values were calculated from analysis of extracts diluted at a ratio of 1:40. The results are reported on a dry weight basis. Initial sample mass was taken into account.

VII Optional QC: No action taken.

A matrix spike was not requested for this project, however, the laboratory submitted the results of a soil-matrix spike from the same QC batch. The %R of Aroclor 1260 in that sample was within the stated control limits.

Overall Assessment:

This data evaluation is based upon the criteria outlined in OSWER Directive 9360.4-01 (1990). With the information provided, the results are considered acceptable for use as reported.

Sample Description: #1 WC/Time 0/Tag 092737 Lab No: 06A
Test Description: Polychlorinated Biphenyls Method: SW846 8080 Test Code: PCB_S
Collected: 02/03/93 13:15

PARAMETER	RESULT	DETECTION LIMIT
PCB-1016	BDL	4.5
PCB-1221	BDL	4.5
PCB-1232	BDL	4.5
PCB-1242	11	4.5
PCB-1248	BDL	4.5
PCB-1254	15	4.5
PCB-1260	BDL	4.5

SURROGATE	%RECOVERY	LIMITS
Tetrachloro-m-xylene	Q	24 - 154

Notes and Definitions for this Report:

EXTRACTED 02/04/93
DATE RUN 02/08/93
ANALYST IYE
UNITS mg/Kg

Sample Description: TP #2/Time 0/Tag 092520 Lab No: 04A
Test Description: Polychlorinated Biphenyls Method: SW846 8080 Test Code: PCB_S
Collected: 02/03/93 13:09

PCB-1260	BDL	4.4

SURROGATE	%RECOVERY	LIMITS
Tetrachloro-m-xylene	Q	24 - 154

Notes and Definitions for this Report:

EXTRACTED 02/04/93
DATE RUN 02/08/93
ANALYST IYE
UNITS mg/Kg

Sample Description: CP/Time 0/Tag 092736 Lab No: 05A
Test Description: Polychlorinated Biphenyls Method: SW846 8080 Test Code: PCB_S
Collected: 02/03/93 13:11

PARAMETER	RESULT	DETECTION LIMIT
PCB-1016	BDL	4.4
PCB-1221	BDL	4.4
PCB-1232	BDL	4.4
PCB-1242	15	4.4
PCB-1248	BDL	4.4
PCB-1254	18	4.4
PCB-1260	BDL	4.4

SURROGATE	%RECOVERY	LIMITS
Tetrachloro-m-xylene	Q	24 - 154

Notes and Definitions for this Report:

EXTRACTED 02/04/93
DATE RUN 02/08/93
ANALYST IYE
UNITS mg/Kg

Sample Description: TP #3/Time 0/Tag 092518 Lab No: 02A
Test Description: Polychlorinated Biphenyls Method: SW846 8080 Test Code: PCB_S
Collected: 02/03/93 13:00

ANALYST IYE
UNITS mg/Kg

Sample Description: TP #1/Time 0/Tag 092519 Lab No: 03A
Test Description: Polychlorinated Biphenyls Method: SW846 8080 Test Code: PCB_S
Collected: 02/03/93 13:04

PARAMETER	RESULT	DETECTION LIMIT
PCB-1016	BDL	4.5
PCB-1221	BDL	4.5
PCB-1232	BDL	4.5
PCB-1242	17	4.5
PCB-1248	BDL	4.5
PCB-1254	23	4.5
PCB-1260	BDL	4.5

SURROGATE	%RECOVERY	LIMITS
Tetrachloro-m-xylene	0	24 - 154

Notes and Definitions for this Report:

EXTRACTED 02/04/93
DATE RUN 02/08/93
ANALYST IYE
UNITS mg/Kg

Sample Description: TP #2/Time 0/Tag 092520 Lab No: 04A
Test Description: Polychlorinated Biphenyls Method: SW846 8080 Test Code: PCB_S
Collected: 02/03/93 13:09

PARAMETER	RESULT	DETECTION LIMIT
PCB-1016	BDL	4.4
PCB-1221	BDL	4.4
PCB-1232	BDL	4.4
PCB-1242	12	4.4
PCB-1248	BDL	4.4
PCB-1254	19	4.4

Sample Description: TP #4/Time 0/Tag 092517 Lab No: 01A
Test Description: Polychlorinated Biphenyls Method: SW846 8080 Test Code: PCB_S
Collected: 02/03/93 12:58

PARAMETER	RESULT	DETECTION LIMIT
PCB-1016	BDL	4.6
PCB-1221	BDL	4.6
PCB-1232	BDL	4.6
PCB-1242	13	4.6
PCB-1248	BDL	4.6
PCB-1254	24	4.6
PCB-1260	BDL	4.6

SURROGATE	%RECOVERY	LIMITS
Tetrachloro-m-xylene	Q	24 - 154

Notes and Definitions for this Report:

EXTRACTED 02/04/93
DATE RUN 02/08/93
ANALYST IYE
UNITS mg/Kg

Sample Description: TP #3/Time 0/Tag 092518 Lab No: 02A
Test Description: Polychlorinated Biphenyls Method: SW846 8080 Test Code: PCB_S
Collected: 02/03/93 13:00

PARAMETER	RESULT	DETECTION LIMIT
PCB-1016	BDL	4.5
PCB-1221	BDL	4.5
PCB-1232	BDL	4.5
PCB-1242	13	4.5
PCB-1248	BDL	4.5
PCB-1254	20	4.5
PCB-1260	BDL	4.5

SURROGATE	%RECOVERY	LIMITS
Tetrachloro-m-xylene	Q	24 - 154

Notes and Definitions for this Report:

EXTRACTED 02/04/93
DATE RUN 02/08/93

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M E M O R A N D U M

DATE: April 21, 1993

TO: Nazeer Uddin, Project Manager, E & E, Cleveland, OH

FROM: Lisa Graczyk, TAT-Chemist, E & E, Chicago, IL

THRU: Pat Zwilling, TAT-Chemist, E & E, Chicago, IL

SUBJECT: **PCB Data Quality Assurance Review, Columbus Scrap Site, Columbus, Franklin County, Ohio**

REF: Analytical TDD: T05-9303-812 Project TDD: T05-9210-022
Analytical PAN: EOH0938AEA Project PAN: EOH0938RBA

The data quality assurance review of two soil samples collected from the Columbus Scrap Site in Columbus, Ohio has been completed. Analysis for the PCB compounds (U.S. EPA Method 8080) was performed by Electro-Analytical Laboratories in Mentor, Ohio.

The two samples were numbered: 9303305-1A and 2A.

Data Qualifications

I Holding Times: Acceptable.

The samples were collected on 03-18-93 and extracted on 03-19-93 which meets the 14 day holding time for extraction.

The samples were analyzed on 03-26-93 which meets the 40 day holding time from extraction to analysis.

II Instrument Performance: Acceptable.

The chromatograms contained adequate peak resolution. All surrogate compounds had less than a 2% retention time shift between samples.

III Initial and Continuing Calibration Verification: Qualified.

The Aroclors of interests in the initial calibration were analyzed at five different concentrations. A continuing calibration was analyzed before the samples were analyzed. The %D between calibration factors for both the initial and continuing calibration was less than 15%.

The %RSD of the calibration factor for all aroclors except one in the initial linearity check were greater than 10%. The %RSD ranged from 16.3% to 33.9% and one was in the limit at 9.8%. Since the linearity criteria was not met all quantitative results are qualified as estimated (J).

IV Matrix Spike/ Matrix Spike Duplicate: Qualified.

The percent recovery for the matrix spike was acceptable at 94%.

No matrix spike duplicate or any sample replicate was analyzed. Therefore, all data is flagged as precision not determined (PND).

V Blank: Acceptable.

The blank analysis contained less than the required detection limits (RDL) for the PCBs of interest.

VI Compound Identification: Acceptable.

The correct retention times were used when identifying the Aroclor and the "fingerprint" pattern for the standard for Aroclor 1254 matches that found in the sample.

VII Overall Assessment of Data for Use

The overall usefulness of the data is based on the criteria outlined in "Quality Assurance/Quality Control Guidance for Removal Activities" (OSWER Directive 9360.4-01 April 1990). Based upon the information provided, the data are acceptable for use with the above stated qualifications.

Data Qualifiers and Definitions

J - The associated numerical value is an estimated quantity because the reported concentrations were less than the contract required detection limits or quality control criteria were not met.

PND - Precision Not Determined.

Electro-Analytical Laboratories

Work Id: T05-9303-812

TEST RESULTS BY SAMPLE

Sample: 01A TP2 – 6 Collected: 03/18/93 11:00

Test Description	Result	Detection Limit	Units	Analyzed	By
Moisture Cont. ASTM C 311	25	1.0	% Moisture	03/23/93	MJS
PCB;Soil/Solid: SW846-8080		1.0			
Aroclor 1242	<1.0		ppm	03/19/93	MH
Aroclor 1254	12		ppm	03/19/93	MH
Aroclor 1260	<1.0		ppm	03/19/93	MH
Aroclor 1016	<1.0		ppm	03/19/93	MH
Aroclor 1221	<1.0		ppm	03/19/93	MH
Aroclor 1232	<1.0		ppm	03/19/93	MH
Aroclor 1248	<1.0		ppm	03/19/93	MH

Sample: 02A TP3 – 6 Collected: 03/18/93 10:52

Test Description	Result	Detection Limit	Units	Analyzed	By
Moisture Cont. ASTM C 311	34	1.0	% Moisture	03/23/93	MJS
PCB;Soil/Solid: SW846-8080		1.0			
Aroclor 1242	<1.0		ppm	03/19/93	MH
Aroclor 1254	8.9		ppm	03/19/93	MH
Aroclor 1260	<1.0		ppm	03/19/93	MH
Aroclor 1016	<1.0		ppm	03/19/93	MH
Aroclor 1221	<1.0		ppm	03/19/93	MH
Aroclor 1232	<1.0		ppm	03/19/93	MH
Aroclor 1248	<1.0		ppm	03/19/93	MH

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M E M O R A N D U M

DATE: June 21, 1993

TO: Nazeer Uddin, TAT Project Manager, E & E, Cleveland, OH

FROM: Emily Landis, TAT-Geochemist, E & E, Cleveland, OH

THRU: Anne A. Busher, ATATL, E & E, Cleveland, OH

SUBJ: **PCB Data Quality Assurance Review**, Columbus Scrap Site, Columbus, Franklin County, Ohio

RE: Analytical TDD: T059305815 Project TDD: T059210022
Analytical PAN: EOH0938AGA Project PAN: EOH0938RBA

The data quality assurance review of 4 composite soil samples collected from the Columbus Scrap site on May 28, 1993 is now complete. The samples were collected by the PRP contractor and submitted by the TAT to Ross Analytical Services of Strongsville, Ohio, for polychlorinated biphenyl (PCB) analysis. The laboratory analyzed the samples by gas chromatography with electron capture detector (GC/ECD), following SW-846 Method 8080. The samples were labeled TP-1-16, TP-2-16, TP-3-16, and TP-4-16, corresponding to the laboratory's numbers 93-06-016-01 through -04, respectively.

Data Qualifications

I Sample Holding Time: Acceptable.

The samples were extracted within the 14-day sample holding time, and analyzed within the 40-day time limit from extraction.

II Instrument Performance: Acceptable.

The standard chromatograms appear to have adequate separation between quantitation peaks. A spot check of surrogate compound retention times indicates that time shifts for both surrogates were less than 0.3%, as required for capillary column GC.

III Initial and Continuing Calibration Verification: Qualified.

The Aroclors of interest (1248, 1254, and 1260) were analyzed at 5 concentrations each; 3 concentrations each are required. The percent relative standard deviations (%RSD) of the calibration factors for each Aroclor is less than or equal to 10% for the

quantitation column initial linearity check, as required, except for Aroclors 1248 (13.2 %RSD) 1254 (13.4 %RSD). Accordingly, quantitative results for those Aroclors are flagged "J". Continuing calibration checks for each Aroclor (except 1248 on the confirmation column) were analyzed daily. The percent difference (%D) between calibration factors for standard analysis was less than or equal to 15% on the quantitation column, and less than or equal to 20% on the confirmation column, as required.

IV Error Determination: Not applicable.

Precision and accuracy were not calculated on these samples. The laboratory reported that they were unable to run matrix spike samples because of the high amount of PCBs in the samples.

V Blank: Acceptable.

The method blank prepared and analyzed with the samples had no PCB compounds above the practical quantitation limits. Surrogate recoveries on the method blank were within quality control limits.

VI Compound Identification: Acceptable.

A comparison of standard and sample chromatograms indicates that more than one Aroclor is present in the samples. Major peaks of Aroclors 1248 and 1254 are present in the sample chromatograms. The laboratory confirmed positive results by use of a double-column GC/ECD.

V Compound Quantitation/Reported Detection Limits: Acceptable.

The results are reported on an as-received basis. The raw data have been properly adjusted to reflect the initial sample mass and the 200X dilution of the extract required to conduct the analysis.

VI Performance Evaluation Samples: Not applicable.

Overall Assessment of Data

This data quality assurance review is based upon the guidelines set forth in OSWER Directive 9360.4-01 (April 1990). With the information provided in the data packet, the results may be considered acceptable for use with the qualifications stated above.

Data Validation Qualifiers

J - The associated numerical value is an estimated quantity because quality control criteria were not met.

Work Order # 93-06-016 Ross Analytical Services, Inc Reported: 06/08/93

Sample Description Soil TP-1-16 Lab No. 01
Test Description PCB's Test Code 8080_P

EXTRACTED 06/02/93 DATE RUN 06/07/93 DILUTION FACTOR 200 UNITS ug/Kg

CAS No.	COMPOUND	RESULT	PQL	
12674-11-2	PCB-1016	<PQL	4400	
11104-28-2	PCB-1221	<PQL	8800	
11141-16-5	PCB-1232	<PQL	4400	
53469-21-9	PCB-1242	<PQL	4400	
12672-29-6	PCB-1248	19000	4400	Y
11097-69-1	PCB-1254	16000	4400	Y
11096-82-5	PCB-1260	<PQL	4400	

6.21.93

SURROGATE	%RECOVERY	LIMITS
Tetrachloro-m-xylene	59	50 - 150
Decachlorobiphenyl	230 Q	50 - 150

Work Order # 93-06-016 Ross Analytical Services, Inc Reported: 06/08/93

Sample Description Soil TP-2-16 Lab No. 02
Test Description PCB's Test Code 8080_P

EXTRACTED 06/02/93 DATE RUN 06/07/93 DILUTION FACTOR 200 UNITS ug/Kg

CAS No.	COMPOUND	RESULT	PQL	
12674-11-2	PCB-1016	<PQL	4000	
11104-28-2	PCB-1221	<PQL	8000	
11141-16-5	PCB-1232	<PQL	4000	
53469-21-9	PCB-1242	<PQL	4000	
12672-29-6	PCB-1248	18000	4000	q
11097-69-1	PCB-1254	15000	4000	q
11096-82-5	PCB-1260	<PQL	4000	

6.21.93

SURROGATE	%RECOVERY	LIMITS
Tetrachloro-m-xylene	0	50 - 150
Decachlorobiphenyl	0	50 - 150

Work Order # 93-06-016 Ross Analytical Services, Inc Reported: 06/08/93

Sample Description Soil TP-3-16 Lab No. 03
Test Description PCB's Test Code 8080_P

EXTRACTED 06/02/93 DATE RUN 06/07/93 DILUTION FACTOR 200 UNITS ug/Kg

CAS No.	COMPOUND	RESULT	PQL	
12674-11-2	PCB-1016	<PQL	5600	
11104-28-2	PCB-1221	<PQL	11000	
11141-16-5	PCB-1232	<PQL	5600	
53469-21-9	PCB-1242	<PQL	5600	
12672-29-6	PCB-1248	13000	5600	Q
11097-69-1	PCB-1254	9000	5600	Q
11096-82-5	PCB-1260	<PQL	5600	ok 6.21.93

SURROGATE	%RECOVERY	LIMITS
Tetrachloro-m-xylene	Q	50 - 150
Decachlorobiphenyl	Q	50 - 150

Work Order # 93-06-016 Ross Analytical Services, Inc Reported: 06/08/93

Sample Description Soil TP-4-16 Lab No. 04
Test Description PCB's Test Code 8080_P

EXTRACTED 06/02/93 DATE RUN 06/07/93 DILUTION FACTOR 200 UNITS ug/Kg

CAS No.	COMPOUND	RESULT	PQL	
12674-11-2	PCB-1016	<PQL	5400	
11104-28-2	PCB-1221	<PQL	11000	
11141-16-5	PCB-1232	<PQL	5400	
53469-21-9	PCB-1242	<PQL	5400	
12672-29-6	PCB-1248	16000	5400	q
11097-69-1	PCB-1254	12000	5400	q
11096-82-5	PCB-1260	<PQL	5400	

ecl 6.21.93

SURROGATE	%RECOVERY	LIMITS
Tetrachloro-m-xylene	57	50 - 150
Decachlorobiphenyl	114	50 - 150

ENVIRONMENTAL PROTECTION AGENCY
Office of Enforcement

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CHAIN OF CUSTODY RECORD

PROJ. NO.	PROJECT NAME
	705-93

SAMPLERS: (Signature) [illegible] / Ecology & Environment Inc

STA. NO.	DATE	TIME	COMP.	GRAB	STATION LOCATION	NO. OF CONTAINERS	[illegible]						REMARKS / EPA Tag #	
[illegible]-16	[illegible]	1000	X			1	1						072524	[illegible]
[illegible]-16	5/28	1005	X			1	1						147632	[illegible]
[illegible]-16	5/28	1010	X			1	1						149633	[illegible]
[illegible]-16	[illegible]/28	1015	X			1	1							
					No other samples									
					Placed [illegible]									
					Shipment to [illegible]									
					Send Results to:									
					Emily [illegible]								QA LEVEL II	
					Ecology & Environment Inc									
					6777 Engle Road								[illegible]	
					Middleburg Hts OH								[illegible]	
					44130									

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[illegible] E&E	[illegible] 1700				
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M E M O R A N D U M

DATE: July 18, 1993

TO: Nazeer Uddin, TAT Project Manager, E & E, Cleveland, OH

FROM: Emily Landis, TAT Geochemist, E & E, Cleveland, OH

VIA: Anne A. Busher, ATATL, E & E, Cleveland, OH

SUBJ: **Total Chloride Data Quality Assurance Review**, Columbus Scrap Site, Columbus, Franklin County, Ohio

RE: Analytical TDD: T059306814 Project TDD: T059210022
Analytical PAN: EOH0938AHA Project PAN: EOH0938RBA

The data quality assurance review of 4 discrete soil samples, collected from the Columbus Scrap site on June 25, 1993, is now complete. The samples were submitted to American Analytical Laboratories of Akron, Ohio for total chloride analysis. The laboratory received the samples June 28, 1993, and analyzed them for total chloride content following ASTM Method D1411. Chloride was extracted from the soil with distilled water, which was then analyzed by titration.

Data Qualifications:

I Sample Holding Time: Not applicable.

II Mercuric Nitrate Standardization: Acceptable.

Three titrations were made for the standard. The percent relative standard deviation was 0.4%.

III Blank: Acceptable.

Chlorine ion was detected in the blank at a level more than twice the detection limit. However, all the sample results were more than 10 times the blank value, therefore no action is taken.

IV Sample Spike: Acceptable.

The percent recovery on the sample TP4-5 was 99.9%.

V Duplicate Sample: Acceptable.

Duplicate analysis of sample CP-5 was within 2% of the original determination.

Overall Assessment of Data:

OSWER Directive 9360.4-01 (1990) does not provide guidelines for the evaluation of ASTM methods. In the professional judgement of the reviewer, the data is acceptable for use as reported.

% Moisture
Method: ASTM D2216

Samp	Sample Description	Result	Units	Detection Limit	Analyzed	By
01A	TP3-1/39646	58.1	%		06/28/93	ROZ
01B	TP3-1-1st Rep./39646	58.1	%		06/28/93	ROZ
01C	TP3-1-2nd Rep./39646	58.1	%		06/28/93	ROZ
02A	TP3-2/39647	49.4	%		06/28/93	ROZ
03A	TP3-3/39648	41.9	%		06/28/93	ROZ
04A	TP3-4/39649	33.5	%		06/28/93	ROZ
05A	TP3-5/39650	20.5	%		06/28/93	ROZ
06A	TP3-WC/39651	52.9	%		06/28/93	ROZ
07A	TP4-1/39652	37.0	%		06/28/93	ROZ
07B	TP4-1-1st Rep./39652	37.0	%		06/28/93	ROZ
07C	TP4-1-2nd Rep./39652	37.0	%		06/28/93	ROZ
08A	TP4-2/39653	38.4	%		06/28/93	ROZ
09A	TP4-3/39654	50.0	%		06/28/93	ROZ
10A	TP4-4/39655	34.1	%		06/28/93	ROZ
11A	TP4-5/39656	43.1	%		06/28/93	ROZ
12A	TP4-WC/39657	33.9	%		06/28/93	ROZ
13A	BG-1/39658	16.4	%		06/28/93	ROZ
14A	CP-1/39659	27.4	%		06/28/93	ROZ
14B	CP-1-1st Rep./39659	27.4	%		06/28/93	ROZ
14C	CP-1-2nd Rep./39659	27.4	%		06/28/93	ROZ
15A	CP-2/39660	35.4	%		06/28/93	ROZ
16A	CP-3/39661	22.4	%		06/28/93	ROZ
17A	CP-4/39662	18.1	%		06/28/93	ROZ
18A	CP-5/39663	23.3	%		06/28/93	ROZ

Soluble Chloride
Method: ASTM D1411

Samp	Sample Description	Result	Units	Detection Limit		Analyzed	By
05B	TP3-5/39650	27.7	mg/Kg	2.5	07/01/93	07/06/93	LAK
11B	TP4-5/39656	31.7	mg/Kg	3.5	07/01/93	07/06/93	LAK
13B	BG-1/39658	34.3	mg/Kg	2.4	07/01/93	07/06/93	LAK
18B	CP-5/39663	37.2	mg/Kg	2.6	07/01/93	07/06/93	LAK

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M E M O R A N D U M

DATE: 13 August 1993

TO: Nazeer Uddin, TAT Project Manager, E & E, Cleveland, Ohio

FROM: Emily Landis, TAT Geochemist, E & E, Cleveland, Ohio

VIA: Patrick Zwilling, ATATL, E & E, Chicago, Illinois

SUBJ: PCB Data Quality Assurance Review, Columbus Scrap Site, Columbus, Franklin County, Ohio

RE: Analytical TDD: T059306814 Project TDD: T059210022
Analytical PAN: EOH0938AHA Project PAN: EOH0938RBA

This data review concerns a re-analysis of sample TP3-4, which was collected from the Columbus Scrap site on 25 June 1993. The original analysis for PCB by SW-846 Method 8080, conducted by American Analytical Laboratories of Akron, Ohio, was reported as 140 ~~10~~ ppm Aroclor 1248 (see my memo to you dated 18 July 1993). The eal 10-14-93 updated laboratory report for this sample concludes that the original report misidentified and therefore incorrectly quantified the Aroclor present in the sample. This amendment is the direct product of the reviewer's demand for confirmatory analysis of a positive PCB result, as required by OSWER Directive 9360.4-01 data validation guidance.

Data Qualifications:

I Holding Time: Acceptable.

The sample's confirmation analysis by GC/MS was conducted on 23 July 1993, which is within the 40-day holding time from the date of extraction.

II Instrument Performance: Acceptable.

Standard chromatograms for Aroclor 1254 for the original analysis on 1 July 1993 have peak resolutions greater than 25%, as required. Adequate peak resolution assures analytical accuracy for quantitation, as well as a recognizable qualitative "fingerprint" pattern. The surrogate compound, tetrachloro-m-xylene, was diluted out of the sample due to the high concentration of PCB Aroclor 1254 in the sample.

III Initial and Continuing Calibrations: Qualified.

The percent relative standard deviation (%RSD) of response factors (RF) for Aroclor 1254 are 21.7%, more than twice the allowed 10% RSD limit. A %RSD greater than 10% indicates that the initial calibration was not linear. Therefore, results associated with this compound must be flagged "J". The percent difference (%D) between the initial and continuing calibrations was less than 15%, as required. Note: Aroclors 1248 and 1260 also had exceeded the %RSD limit, as reported in the Data Quality Assurance Review dated 23 July 1993, therefore results for those compounds are also flagged "J".

VI Compound Identification: Acceptable.

The sample chromatograms for this project were masked by substantial quantities of hydrocarbons present in each sample. All the samples, except the one in question, appeared to contain a mixture of Aroclors 1248 and 1254. This was confirmed by GC/MS analysis of sample CP-3. The ion chromatogram for sample TP3-4 (produced by GC/MS analysis), however, exhibited a pattern similar to Aroclor 1254.

VII Compound Quantitation: Acceptable.

After a closer examination of the sample and standard chromatograms and the ion chromatograms, the sample result was recalculated to the correct standard, Aroclor 1254. The peak areas themselves did not change, but the standard did, which accounts for the very different quantitative result for sample TP-3.

Overall Assessment of Data:

The amendment submitted by the laboratory confirms the positive result detected in the sample. Therefore, in the reviewer's professional judgement, the amended positive result for sample TP-3 may be considered acceptable for use with the qualification mentioned in Section III.

ecology and environment, inc.
6777 ENGLE ROAD, CLEVELAND, OHIO 44130, TEL. (216) 243-3330
International Specialists in the Environment

MEMORANDUM

DATE: July 18, 1993

TO: Nazeer Uddin, TAT Project Manager, E & E, Cleveland, OH

FROM: Emily S. Landis, TAT Geochemist, E & E, Cleveland, OH

VIA: Anne A. Busher, ATATL, E & E, Cleveland, OH

SUBJ: **PCB Data Quality Assurance Review**, Columbus Scrap Site, Columbus, Franklin County, Ohio

RE: Analytical TDD: T059306814 Project TDD: T059210022
Analytical PAN: EOH0938AHA Project PAN: EOH0938RBA

The data quality assurance review of 15 discrete and 1 composite soil, and 2 composite wood chip samples, collected from the Columbus Scrap on June 25, 1993, is now complete. The samples were submitted to American Analytical Laboratories of Akron, Ohio, to be analyzed for polychlorinated biphenyls (PCB). The laboratory received the samples on June 28, 1993, and analyzed them by gas chromatography with electron capture detector, following SW-846 Method 8080. Sample labels and corresponding laboratory identification numbers are attached to the sample results.

Data Qualifications:

I Sample Holding Times: Acceptable.

The samples were extracted and analyzed within the respective 14-day and 40-day time limits.

II Instrument Performance: Acceptable.

Adequate peak resolution was achieved on the quantitation column. Tetrachloro-m-xylene (TCMX) surrogate compound percent recoveries (%R) were within 20% of the original spiked value.

III Initial and Continuing Calibrations: Qualified.

Five concentrations each of Aroclors 1248 and 1260 were run prior to sample analysis; calibration for all Aroclors of interest (i.e. quantitative results reported) is required. Therefore, quantitative results for all other Aroclors must be flagged "J". The percent relative standard deviations (%RSD)

exceeded the 10% limit for the initial calibration linearity check. Therefore, all positive results for Aroclors 1248 and 1260 must be flagged "J". The percent difference for standard analysis between quantitation and confirmation columns cannot be evaluated because no confirmation column analysis was conducted.

IV Error Determination: Precision and bias not calculated.

Samples TP3-1, TP4-1, and CP-1 were extracted and analyzed in triplicate. The %RSD for sample TP3-1 is 13%; for CP-1, 4%; and for TP4-1, 2%. Percent error and bias are calculated only for a minimum of 8 replicates per sample matrix.

V Blanks: Acceptable.

Method blanks were prepared for each extraction batch. All blanks contained less than the instrument detection levels for PCB compounds.

VI Compound Identification: Qualified.

Retention time windows are not reported, however, positive results match the standard chromatogram pattern. Dual column or GC/MS confirmation of positive results was not conducted, therefore all reported positive results must be flagged "NJ".

VII Compound Quantitation and Detection Limits: Acceptable.

All reported values have been correctly adjusted to reflect dilutions and dry weight factors.

VIII Performance Evaluation Samples: Not applicable.

IX Optional QC Checks: No action taken.

The laboratory reported that surrogates and matrix spikes were diluted out due to high concentrations of PCB in the samples.

Overall Assessment of Data:

This data evaluation is based upon the guidelines set forth in OSWER Directive 9360.4-01 (1990). With the qualifications described above, the results may be considered acceptable for use in a qualitative way.

Data Validation Qualifiers

J The associated numerical value is an estimated quantity because quality control criteria were not met.

NJ Presumptive evidence of the presence of the compound at an estimated quantity.

AMERICAN ANALYTICAL LABORATORIES, INC.

INDUSTRIAL HYGIENE AND ENVIRONMENTAL SCIENCES

American Analytical
Laboratories, Inc.
840 S. Main Street
Akron, Ohio 44311
Attn: Tim Lavey
Phone: (216) 535-1300

Ecology & Environment, Inc.
6777 Engle Road - Suite N
Cleveland, Ohio 44130

Attn: Emily Landis
Invoice Number:

Order #: 93-06-412
Date: 07/10/93
Work ID: Project #T05-93
Date Received: 06/28/93
Date Completed: 07/06/93
Client Code: ECOLOGY_ENVI

Sample results are reported on a dry weight basis.

SAMPLE IDENTIFICATION

Sample Number	Sample Description	Sample Number	Sample Description
01	TP3-1/39646	10	TP4-4/39655
02	TP3-2/39647	11	TP4-5/39656
03	TP3-3/39648	12	TP4-WC/39657
04	TP3-4/39649	13	BG-1/39658
05	TP3-5/39650	14	CP-1/39659
06	TP3-WC/39651	15	CP-2/39660
07	TP4-1/39652	16	CP-3/39661
08	TP4-2/39653	17	CP-4/39662
09	TP4-3/39654	18	CP-5/39663

Definitions : BDL - Below Detection Limit
Data Flags : J - Value measured below detection limit
B - Analyte also detected in blank

Certified By
T.J. Lavey

Sample Description: TP3-1/39646 Lab No: 01A
Test Description: Polychlorinated Biphenyls Method: SW846 8080 Test Code: PCB_S
Collected: 06/25/93 13:15

PARAMETER	RESULT	DETECTION LIMIT	
PCB-1016	BDL	2.4	q
PCB-1221	BDL	2.4	"
PCB-1232	BDL	2.4	"
PCB-1242	BDL	2.4	"
PCB-1248	10	2.4	NQ
PCB-1254	BDL	2.4	q
PCB-1260	BDL	2.4	q

4.15.93

SURROGATE	%RECOVERY	LIMITS
Tetrachloro-m-xylene	Q	24 - 154

Notes and Definitions for this Report:

EXTRACTED 06/29/93
DATE RUN 07/01/93
ANALYST IYE
UNITS mg/Kg

Sample Description: TP3-1-1st Rep./39646 Lab No: 018
Test Description: Polychlorinated Biphenyls Method: SW846 8080 Test Code: PCB_S
Collected: 06/25/93 13:15

PARAMETER	RESULT	DETECTION LIMIT	
PCB-1016	BDL	2.4	Q
PCB-1221	BDL	2.4	
PCB-1232	BDL	2.4	
PCB-1242	BDL	2.4	
PCB-1248	12	2.4	NQ
PCB-1254	BDL	2.4	Q
PCB-1260	BDL	2.4	

7.18.93

SURROGATE	%RECOVERY	LIMITS
Tetrachloro-m-xylene	0	24 - 154

Notes and Definitions for this Report:

EXTRACTED 06/29/93
DATE RUN 07/01/93
ANALYST IYE
UNITS mg/Kg

Sample Description: TP3-1-2nd Rep./39646 Lab No: 01C
Test Description: Polychlorinated Biphenyls Method: SW846 8080 Test Code: PCB_S
Collected: 06/25/93 13:15

PARAMETER	RESULT	DETECTION LIMIT	
PCB-1016	BDL	2.4	q
PCB-1221	BDL	2.4	
PCB-1232	BDL	2.4	
PCB-1242	BDL	2.4	
PCB-1248	13	2.4	NQ
PCB-1254	BDL	2.4	q
PCB-1260	BDL	2.4	q

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SURROGATE	%RECOVERY	LIMITS
Tetrachloro-m-xylene	Q	24 - 154

Notes and Definitions for this Report:

EXTRACTED 07/02/93
DATE RUN 07/02/93
ANALYST IYE
UNITS mg/Kg

Sample Description: TP3-2/39647 Lab No: 02A
Test Description: Polychlorinated Biphenyls Method: SW846 8080 Test Code: PCB_S
Collected: 06/25/93 13:25

PARAMETER	RESULT	DETECTION LIMIT	
PCB-1016	BDL	2.0	Q
PCB-1221	BDL	2.0	
PCB-1232	BDL	2.0	
PCB-1242	BDL	2.0	
PCB-1248	11	2.0	NQ
PCB-1254	BDL	2.0	Q
PCB-1260	BDL	2.0	Q

7.10.93

SURROGATE	%RECOVERY	LIMITS
Tetrachloro-m-xylene	Q	24 - 154

Notes and Definitions for this Report:

EXTRACTED 06/29/93
DATE RUN 07/01/93
ANALYST IYE
UNITS mg/Kg

Sample Description: TP3-3/39648 Lab No: 03A
Test Description: Polychlorinated Biphenyls Method: SW846 8080 Test Code: PCB_S
Collected: 06/25/93 13:30

PARAMETER	RESULT	DETECTION LIMIT	
PCB-1016	BDL	1.7	Q
PCB-1221	BDL	1.7	
PCB-1232	BDL	1.7	
PCB-1242	BDL	1.7	
PCB-1248	10	1.7	NQ
PCB-1254	BDL	1.7	Q
PCB-1260	BDL	1.7	Q

7.18.93

SURROGATE	%RECOVERY	LIMITS
Tetrachloro-m-xylene	Q	24 - 154

Notes and Definitions for this Report:

EXTRACTED 06/29/93
DATE RUN 07/01/93
ANALYST IYE
UNITS mg/Kg

Sample Description: TP3-4/39649 Lab No: 04A
Test Description: Polychlorinated Biphenyls Method: SW846 8080 Test Code: PCB_S
Collected: 06/25/93 13:35

PARAMETER	RESULT	DETECTION LIMIT	
PCB-1016	BDL	30	Q
PCB-1221	BDL	30	
PCB-1232	BDL	30	
PCB-1242	BDL	30	
PCB-1248	140	30	NQ
PCB-1254	BDL	30	Q
PCB-1260	BDL	30	Q

eL 7.18.93

SURROGATE	%RECOVERY	LIMITS
Tetrachloro-m-xylene	Q	24 - 154

Notes and Definitions for this Report:

EXTRACTED 06/29/93
DATE RUN 07/02/93
ANALYST IYE
UNITS mg/Kg

Sample Description: TP3-5/39650 Lab No: 05A
Test Description: Polychlorinated Biphenyls Method: SW846 8080 Test Code: PCB_S
Collected: 06/25/93 13:40

PARAMETER	RESULT	DETECTION LIMIT	
PCB-1016	BDL	2.5	q
PCB-1221	BDL	2.5	|
PCB-1232	BDL	2.5	|
PCB-1242	BDL	2.5	↓
PCB-1248	10	2.5	NQ
PCB-1254	BDL	2.5	q
PCB-1260	BDL	2.5	q

LC 7.15.93

SURROGATE	%RECOVERY	LIMITS
Tetrachloro-m-xylene	0	24 - 154

Notes and Definitions for this Report:

EXTRACTED 06/29/93
DATE RUN 07/01/93
ANALYST IYE
UNITS mg/Kg

Sample Description: TP3-WC/39651 Lab No: 06A
Test Description: Polychlorinated Biphenyls Method: SW846 8080 Test Code: PCB_S
Collected: 06/25/93 13:45

PARAMETER	RESULT	DETECTION LIMIT	
PCB-1016	BDL	1.0	9
PCB-1221	BDL	1.0	
PCB-1232	BDL	1.0	
PCB-1242	BDL	1.0	
PCB-1248	3.8	1.0	NQ
PCB-1254	BDL	1.0	9
PCB-1260	BDL	1.0	9

7.18.93

SURROGATE	%RECOVERY	LIMITS
Tetrachloro-m-xylene	Q	24 - 154

Notes and Definitions for this Report:

EXTRACTED 06/29/93
DATE RUN 07/01/93
ANALYST IYE
UNITS mg/Kg

Sample Description: TP4-1/39652 Lab No: 07A
Test Description: Polychlorinated Biphenyls Method: SW846 8080 Test Code: PCB_S
Collected: 06/25/93 13:50

PARAMETER	RESULT	DETECTION LIMIT	
PCB-1016	BDL	1.6	q
PCB-1221	BDL	1.6	"
PCB-1232	BDL	1.6	"
PCB-1242	BDL	1.6	"
PCB-1248	8.2	1.6	NQ
PCB-1254	BDL	1.6	q
PCB-1260	BDL	1.6	q

el 7-18-93

SURROGATE	%RECOVERY	LIMITS
Tetrachloro-m-xylene	Q	24 - 154

Notes and Definitions for this Report:

EXTRACTED 06/29/93
DATE RUN 07/01/93
ANALYST IYE
UNITS mg/Kg

Sample Description: TP4-1-1st Rep./39652 Lab No: 07B
Test Description: Polychlorinated Biphenyls Method: SW846 8080 Test Code: PCB_S
Collected: 06/25/93 13:50

PARAMETER	RESULT	DETECTION LIMIT	
PCB-1016	BDL	1.6	q
PCB-1221	BDL	1.6	
PCB-1232	BDL	1.6	
PCB-1242	BDL	1.6	
PCB-1248	8.6	1.6	NQ
PCB-1254	BDL	1.6	q
PCB-1260	BDL	1.6	q

SURROGATE	%RECOVERY	LIMITS
Tetrachloro-m-xylene	Q	24 - 154

ec 7.18.93

Notes and Definitions for this Report:

EXTRACTED 06/29/93
DATE RUN 07/01/93
ANALYST IYE
UNITS mg/Kg

Sample Description: TP4-1-2nd Rep./39652 Lab No: 07C
Test Description: Polychlorinated Biphenyls Method: SW846 8080 Test Code: PCB_S
Collected: 06/25/93 13:50

PARAMETER	RESULT	DETECTION LIMIT	
PCB-1016	BDL	1.6	Q
PCB-1221	BDL	1.6	
PCB-1232	BDL	1.6	
PCB-1242	BDL	1.6	
PCB-1248	8.4	1.6	NQ
PCB-1254	BDL	1.6	Q
PCB-1260	BDL	1.6	Q

7.18.93

SURROGATE	%RECOVERY	LIMITS
Tetrachloro-m-xylene	Q	24 - 154

Notes and Definitions for this Report:

EXTRACTED 06/29/93
DATE RUN 07/01/93
ANALYST IYE
UNITS mg/Kg

Sample Description: TP4-2/39653 Lab No: 08A
Test Description: Polychlorinated Biphenyls Method: SW846 8080 Test Code: PCB_S
Collected: 06/25/93 13:55

PARAMETER	RESULT	DETECTION LIMIT	
PCB-1016	BDL	1.6	q
PCB-1221	BDL	1.6	
PCB-1232	BDL	1.6	
PCB-1242	BDL	1.6	
PCB-1248	8.8	1.6	NJ
PCB-1254	BDL	1.6	q
PCB-1260	BDL	1.6	q

7.18.93

SURROGATE	%RECOVERY	LIMITS
Tetrachloro-m-xylene	0	24 - 154

Notes and Definitions for this Report:

EXTRACTED 06/29/93
DATE RUN 07/01/93
ANALYST IYE
UNITS mg/Kg

Sample Description: TP4-3/39654 Lab No: 09A
Test Description: Polychlorinated Biphenyls Method: SW846 8080 Test Code: PCB_S
Collected: 06/25/93 14:00

PARAMETER	RESULT	DETECTION LIMIT	
PCB-1016	BDL	2.0	Q
PCB-1221	BDL	2.0	
PCB-1232	BDL	2.0	
PCB-1242	BDL	2.0	
PCB-1248	8.8	2.0	NQ
PCB-1254	BDL	2.0	Q
PCB-1260	BDL	2.0	Q

7.18.93

SURROGATE	%RECOVERY	LIMITS
Tetrachloro-m-xylene	Q	24 - 154

Notes and Definitions for this Report:

EXTRACTED 06/29/93
DATE RUN 07/01/93
ANALYST IYE
UNITS mg/Kg

Sample Description: TP4-4/39655 Lab No: 10A
Test Description: Polychlorinated Biphenyls Method: SW846 8080 Test Code: PCB_S
Collected: 06/25/93 14:05

PARAMETER	RESULT	DETECTION LIMIT	
PCB-1016	BDL	3.0	Q
PCB-1221	BDL	3.0	"
PCB-1232	BDL	3.0	"
PCB-1242	BDL	3.0	"
PCB-1248	12	3.0	NQ
PCB-1254	BDL	3.0	Q
PCB-1260	BDL	3.0	Q

LC 7.18.93

SURROGATE	%RECOVERY	LIMITS
Tetrachloro-m-xylene	Q	24 - 154

Notes and Definitions for this Report:

EXTRACTED 06/29/93
DATE RUN 07/01/93
ANALYST IYE
UNITS mg/Kg

Sample Description: TP4-5/39656 Lab No: 11A
Test Description: Polychlorinated Biphenyls Method: SW846 8080 Test Code: PCB_S
Collected: 06/25/93 14:10

PARAMETER	RESULT	DETECTION LIMIT	
PCB-1016	BDL	3.5	Q
PCB-1221	BDL	3.5	"
PCB-1232	BDL	3.5	"
PCB-1242	BDL	3.5	"
PCB-1248	13	3.5	NQ
PCB-1254	BDL	3.5	Q
PCB-1260	BDL	3.5	Q

7-15-93

SURROGATE	%RECOVERY	LIMITS
Tetrachloro-m-xylene	0	24 - 154

Notes and Definitions for this Report:

EXTRACTED 06/29/93
DATE RUN 07/01/93
ANALYST IYE
UNITS mg/Kg

Sample Description: TP4-WC/39657 Lab No: 12A
Test Description: Polychlorinated Biphenyls Method: SW846 8080 Test Code: PCB_S
Collected: 06/25/93 14:15

PARAMETER	RESULT	DETECTION LIMIT	
PCB-1016	BDL	1.5	q
PCB-1221	BDL	1.5	
PCB-1232	BDL	1.5	
PCB-1242	BDL	1.5	
PCB-1248	5.6	1.5	NQ
PCB-1254	BDL	1.5	q
PCB-1260	BDL	1.5	q

2.18.93

SURROGATE	%RECOVERY	LIMITS
Tetrachloro-m-xylene	Q	24 - 154

Notes and Definitions for this Report:

EXTRACTED 06/29/93
DATE RUN 07/02/93
ANALYST IYE
UNITS mg/Kg

Sample Description: BG-1/39658 Lab No: 13A
Test Description: Polychlorinated Biphenyls Method: SW846 8080 Test Code: PCB_S
Collected: 06/25/93 14:20

PARAMETER	RESULT	DETECTION LIMIT	
PCB-1016	BDL	12	q
PCB-1221	BDL	12	
PCB-1232	BDL	12	
PCB-1242	BDL	12	
PCB-1248	19	12	NQ
PCB-1254	BDL	12	q
PCB-1260	BDL	12	q

7.18.93

SURROGATE	%RECOVERY	LIMITS
Tetrachloro-m-xylene	0	24 - 154

Notes and Definitions for this Report:

EXTRACTED 06/29/93
DATE RUN 07/02/93
ANALYST IYE
UNITS mg/Kg

Sample Description: CP-1/39659 Lab No: 14A
Test Description: Polychlorinated Biphenyls Method: SW846 8080 Test Code: PCB_S
Collected: 06/25/93 12:15

PARAMETER	RESULT	DETECTION LIMIT	
PCB-1016	BDL	5.5	q
PCB-1221	BDL	5.5	
PCB-1232	BDL	5.5	
PCB-1242	BDL	5.5	
PCB-1248	16	5.5	NQ
PCB-1254	BDL	5.5	q
PCB-1260	BDL	5.5	q

7.18.93

SURROGATE	%RECOVERY	LIMITS
Tetrachloro-m-xylene	Q	24 - 154

Notes and Definitions for this Report:

EXTRACTED 06/29/93
DATE RUN 07/02/93
ANALYST IYE
UNITS mg/Kg

Sample Description: CP-1-1st Rep./39659 Lab No: 14B
Test Description: Polychlorinated Biphenyls Method: SW846 8080 Test Code: PCB_S
Collected: 06/25/93 12:15

PARAMETER	RESULT	DETECTION LIMIT	
PCB-1016	BDL	5.5	q
PCB-1221	BDL	5.5	
PCB-1232	BDL	5.5	
PCB-1242	BDL	5.5	
PCB-1248	16	5.5	Nq
PCB-1254	BDL	5.5	q
PCB-1260	BDL	5.5	q

7.18.93

SURROGATE	%RECOVERY	LIMITS
Tetrachloro-m-xylene	Q	24 - 154

Notes and Definitions for this Report:

EXTRACTED 06/29/93
DATE RUN 07/02/93
ANALYST IYE
UNITS mg/Kg

Sample Description: CP-1-2nd Rep./39659 Lab No: 14C
Test Description: Polychlorinated Biphenyls Method: SW846 8080 Test Code: PCB_S
Collected: 06/25/93 12:15

PARAMETER	RESULT	DETECTION LIMIT	
PCB-1016	BDL	5.5	Q
PCB-1221	BDL	5.5	
PCB-1232	BDL	5.5	
PCB-1242	BDL	5.5	
PCB-1248	15	5.5	NQ
PCB-1254	BDL	5.5	Q
PCB-1260	BDL	5.5	Q

7.15.93

SURROGATE	%RECOVERY	LIMITS
Tetrachloro-m-xylene	0	24 - 154

Notes and Definitions for this Report:

EXTRACTED 06/29/93
DATE RUN 07/02/93
ANALYST IYE
UNITS mg/Kg

Sample Description: CP-2/39660 Lab No: 15A
Test Description: Polychlorinated Biphenyls Method: SW846 8080 Test Code: PCB_S
Collected: 06/25/93 12:20

PARAMETER	RESULT	DETECTION LIMIT	
PCB-1016	BDL	3.9	g
PCB-1221	BDL	3.9	
PCB-1232	BDL	3.9	
PCB-1242	BDL	3.9	
PCB-1248	11	3.9	NQ
PCB-1254	BDL	3.9	g
PCB-1260	BDL	3.9	g

7-18-93

SURROGATE	%RECOVERY	LIMITS
Tetrachloro-m-xylene	Q	24 - 154

Notes and Definitions for this Report:

EXTRACTED 06/29/93
DATE RUN 07/02/93
ANALYST IYE
UNITS mg/Kg

Sample Description: CP-3/39661 Lab No: 16A
Test Description: Polychlorinated Biphenyls Method: SW846 8080 Test Code: PCB_S
Collected: 06/25/93 12:25

PARAMETER	RESULT	DETECTION LIMIT	
PCB-1016	BDL	13	g
PCB-1221	BDL	13	
PCB-1232	BDL	13	
PCB-1242	BDL	13	
PCB-1248	22	13	NG
PCB-1254	BDL	13	g
PCB-1260	BDL	13	g

LL 7.18.93

SURROGATE	%RECOVERY	LIMITS
Tetrachloro-m-xylene	0	24 - 154

Notes and Definitions for this Report:

EXTRACTED 06/29/93
DATE RUN 07/02/93
ANALYST IYE
UNITS mg/Kg

Sample Description: CP-4/39662 Lab No: 17A
Test Description: Polychlorinated Biphenyls Method: SW846 8080 Test Code: PCB_S
Collected: 06/25/93 12:30

PARAMETER	RESULT	DETECTION LIMIT	
PCB-1016	BDL	24	g
PCB-1221	BDL	24	
PCB-1232	BDL	24	
PCB-1242	BDL	24	
PCB-1248	47	24	NQ
PCB-1254	BDL	24	g
PCB-1260	BDL	24	g

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SURROGATE	%RECOVERY	LIMITS
Tetrachloro-m-xylene	Q	24 - 154

Notes and Definitions for this Report:

EXTRACTED 06/29/93
DATE RUN 07/02/93
ANALYST IYE
UNITS mg/Kg

Sample Description: CP-5/39663 Lab No: 18A
Test Description: Polychlorinated Biphenyls Method: SW846 8080 Test Code: PCB_S
Collected: 06/25/93 12:35

PARAMETER	RESULT	DETECTION LIMIT
PCB-1016	BDL	13
PCB-1221	BDL	13
PCB-1232	BDL	13
PCB-1242	BDL	13
PCB-1248	20	13
PCB-1254	BDL	13
PCB-1260	BDL	13

SURROGATE	%RECOVERY	LIMITS
Tetrachloro-m-xylene	0	24 - 154

Notes and Definitions for this Report:

EXTRACTED 06/29/93
DATE RUN 07/02/93
ANALYST IYE
UNITS mg/Kg

ENVIRONMENTAL PROTECTION AGENCY
Office of Enforcement

CHAIN OF CUSTODY RECORD

REGION 5
230 South Dearborn Street
Chicago, Illinois 60604

PROJ. NO. | PROJECT NAME: TOS-93

SAMPLERS: (Signature) Hdhazeeruddi/ECOLOGY & ENVIRONMENT INC

PAGE 1 OF 2

STA. NO.	DATE	TIME	COMP.	GRAB	STATION LOCATION	NO. OF CONTAINERS	TOTAL PCBs (ug/kg)	TOTAL CHLORIDE	CUSTODY SEAL #s	MATRIX	REMARKS
TP3-1	6/25/93	1315		X	+2 REPLICATES	1	X		39646	SOIL	
TP3-2	6/25/93	1325		X		1	X		39647	SOIL	
TP3-3	6/25/93	1330		X		1	X		39648	SOIL	
TP3-4	6/25/93	1335		X		1	X		39649	SOIL	
TP3-5	6/25/93	1340		X		1	X	X	39650	SOIL	
TP3-WC	6/25/93	1345	X		(WOOD CHIPS) PULVERIZE IN LAB.	1	X		39651	SOIL	(WOOD CHIPS)
TP4-1	6/25/93	1350			+2 REPLICATES	1	X		39652	SOIL	
TP4-2	6/25/93	1355				1	X		39653	SOIL	
TP4-3	6/25/93	1400				1	X		39654	SOIL	
TP4-4	6/25/93	1405				1	X		39655	SOIL	
TP4-5	6/25/93	1410				1	X	X	39656	SOIL	
TP4-WC	6/25/93	1415			(WOOD CHIPS) PULVERIZE IN LAB.	1	X		39657	SOIL	(WOOD CHIPS)
BG-1	6/25/93	1420	X			1	X	X	39658	SOIL	
CP-1	6/25/93	1215		X	+2 REPLICATES	1	X		39659	SOIL	
CP-2	6/25/93	1220		X		1	X		39660	SOIL	

Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Relinquished by: (Signature)	Date / Time	Received by: (Signature)
Hdhazeeruddi EBE	6/28/93 1350				
Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Relinquished by: (Signature)	Date / Time	Received by: (Signature)
Relinquished by: (Signature)	Date / Time	Received for Laboratory by: (Signature)	Date / Time	Remarks	
				AMERICAN ANALYTICAL (PICK-UP)	

Distribution: White — Accompanies Shipment; Pink — Coordinator Field Files; Yellow — Laboratory File

ENVIRONMENTAL PROTECTION AGENCY
Office of Enforcement

E0H0938RAA

CHAIN OF CUSTODY RECORD

REGION 5
230 South Dearborn Street
Chicago, Illinois 60604

PAGE 2 OF 2

PROJ. NO.	PROJECT NAME
	T05-93

SAMPLERS: (Signature) [signature] / ECOLOGY & ENVIRONMENT INC.

STA. NO.	DATE	TIME	COMP.	GRAB	STATION LOCATION	NO. OF CON-TAINERS	TOTAL PCB 8080	TOTAL CHLORIDE					REMARKS: CUSTODY SEAL #s	MATRIX
CP-3	6/25/93	1225		X		1	X						39661	SOIL
CP-4	6/25/93	1230		X		1	X						39662	SOIL
CP-5	6/25/93	1235		X		1	X	X					39663	
					no other Samples —									
					project Complete (no Samples)									
					Shipment to follow									
					Send results to:								QA LEVEL II is Required	
					Emily Landis									
					Ecology & Environment Inc								Turn around Verbal - 7 days	
					6777 Engle Road								Hard Copy - 14 days	
					MIDDLEBURG Hts. OH									
					44130									
					(Tel) 216-243-3330									
					(fax) 216-243-6923									

Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Relinquished by: (Signature)	Date / Time	Received by: (Signature)
[signature] E&E	6/28/93 1350	[signature]			
Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Relinquished by: (Signature)	Date / Time	Received by: (Signature)
Relinquished by: (Signature)	Date / Time	Received for Laboratory by: (Signature)	Date / Time	Remarks	
				AMERICAN ANALYTICAL LABS (PICK-UP) [illegible]	

Distribution: White — Accompanies Shipment; Pink — Coordinator Field Files; Yellow — Laboratory File

APPENDIX C

SOIL SAMPLE RESULTS FOR TREATABILITY STUDY

SDMS US EPA Region V

Imagery Insert Form

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☐ Illegible due to bad source documents. Image(s) in SDMS is equivalent to hard copy.

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Specify Type of Document(s) / Comment

☐ **Unscannable Material: Oversized ____ or ___ Format.**
Due to certain scanning equipment capability limitations, the document page(s) is not available in SDMS. The original document is available for viewing at the Superfund Records center.

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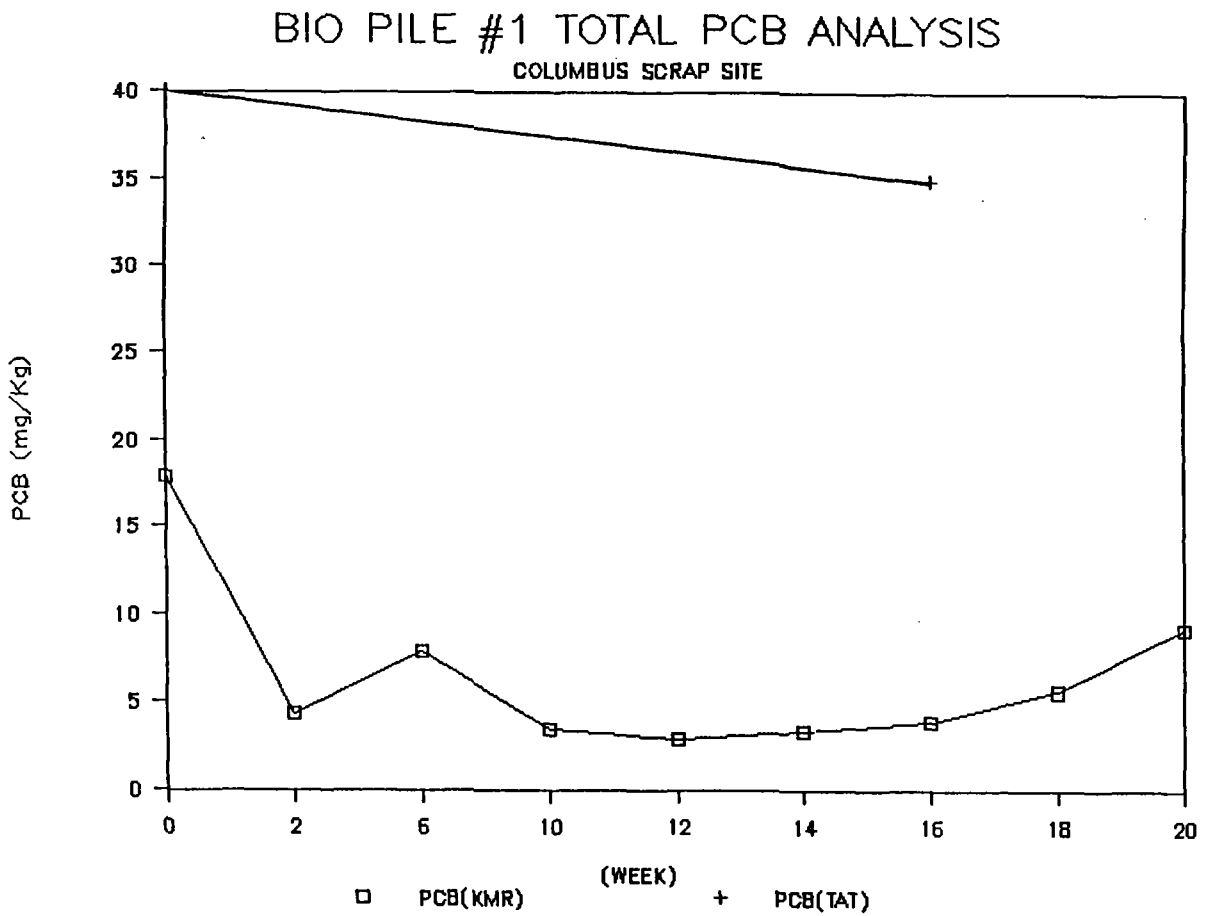
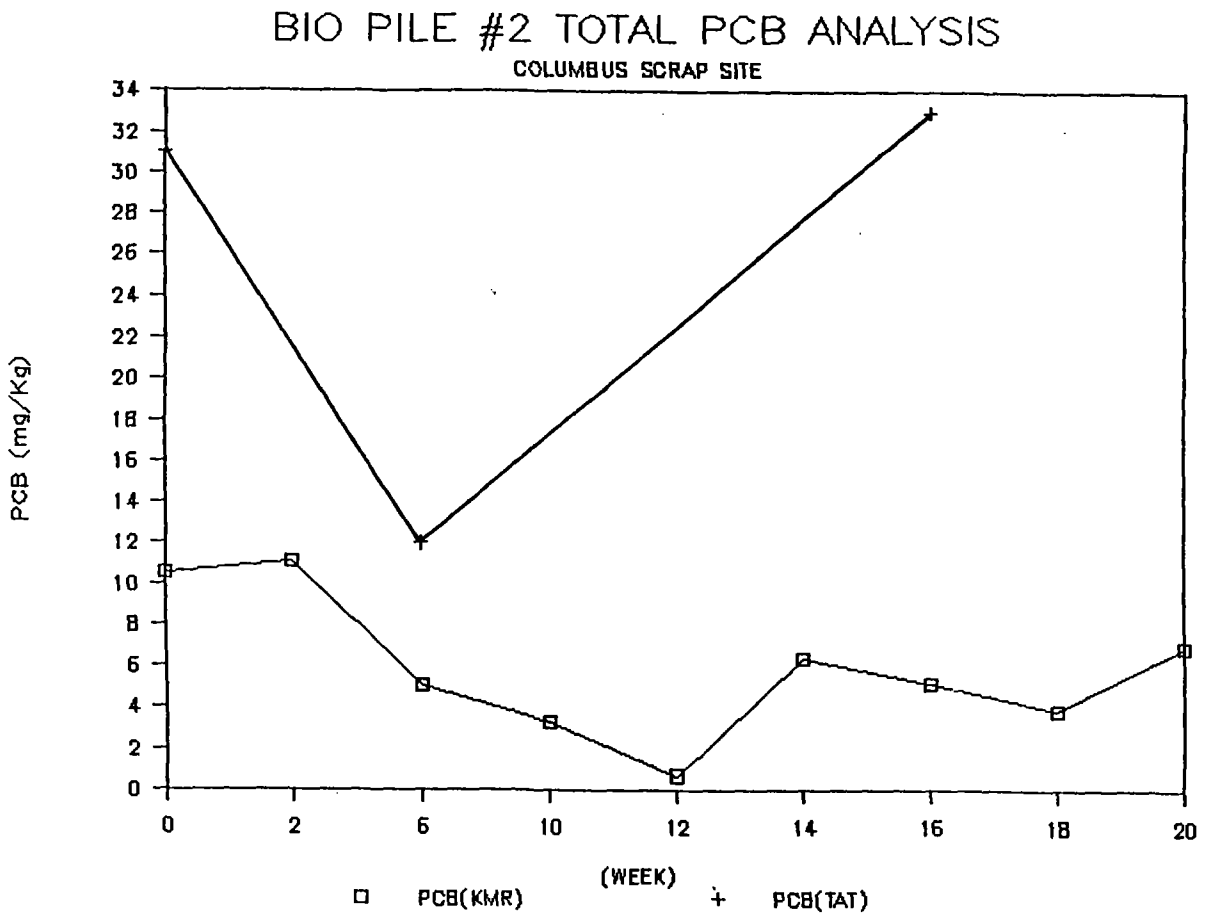
☐ **Other:**

APPENDIX D

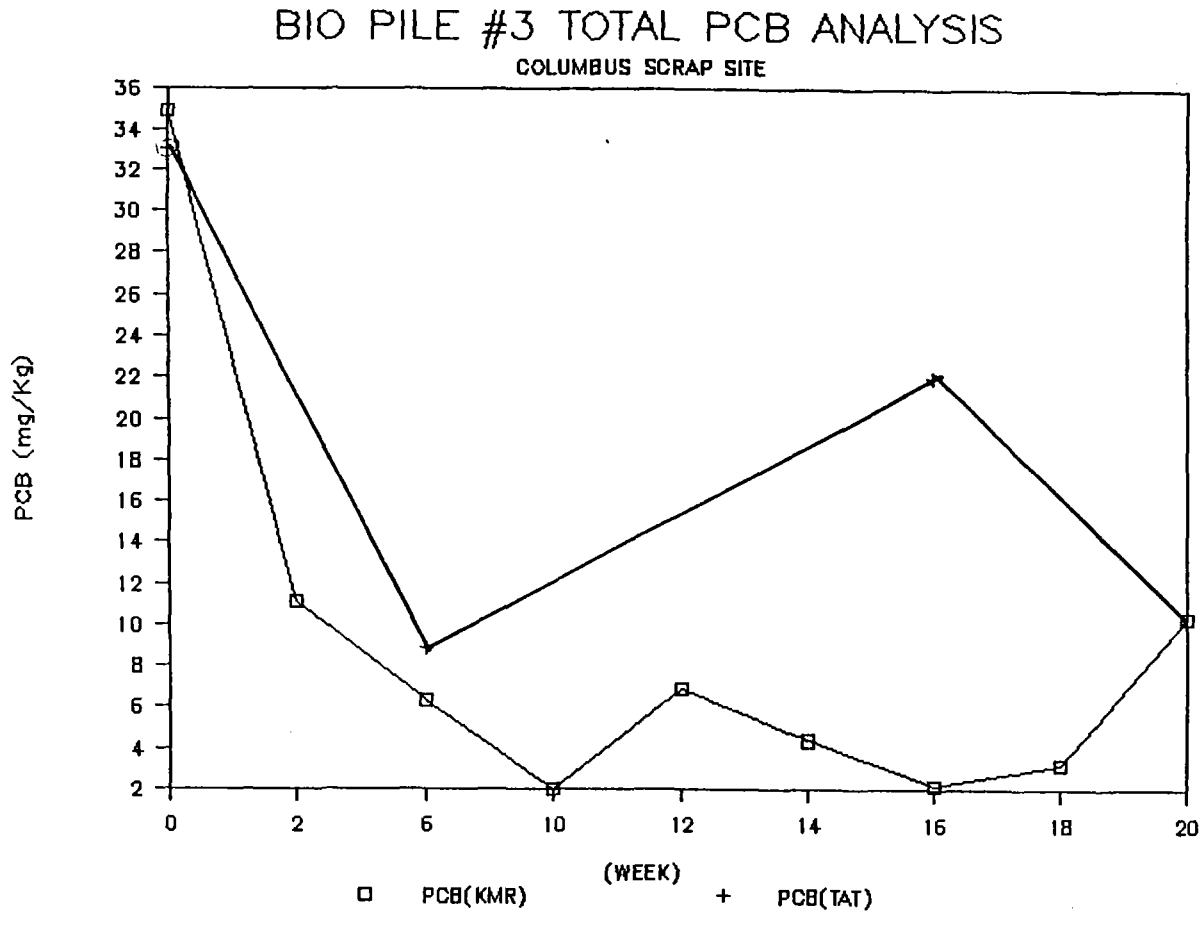
GRAPHS



Treatment Design: Plot #1 soil amended at time 0 and week 2 with uninoculated wood chips, tilled weekly.

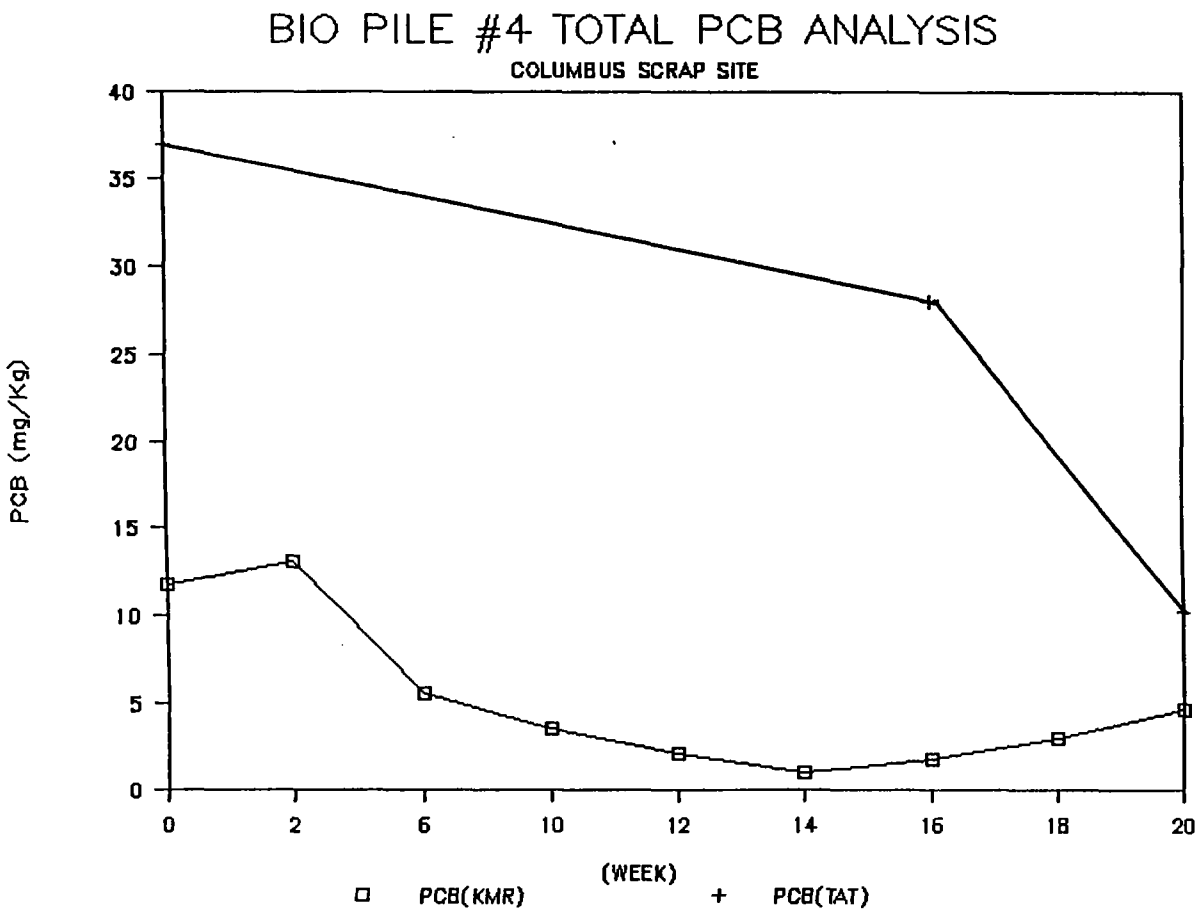


Treatment Design: Plot #2 soil amended at time 0 and week 2 with wood chips inoculated with fungus, tilled weekly.



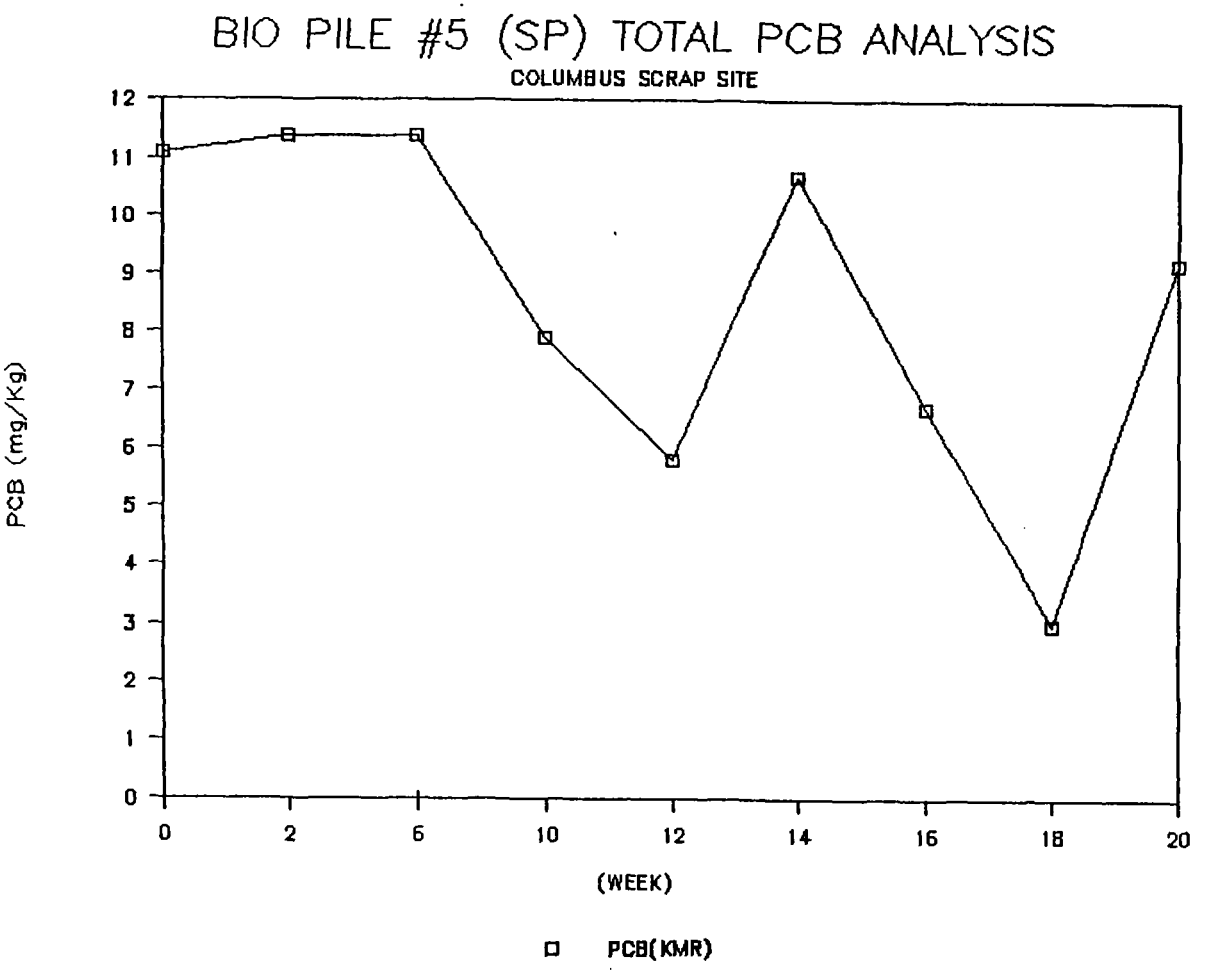
The 20th week value is the average of discrete samples

Treatment Design: Plot #3 soil amended at time 0 and week 2 with wood chips inoculated with fungus, tilled at time 0 only.

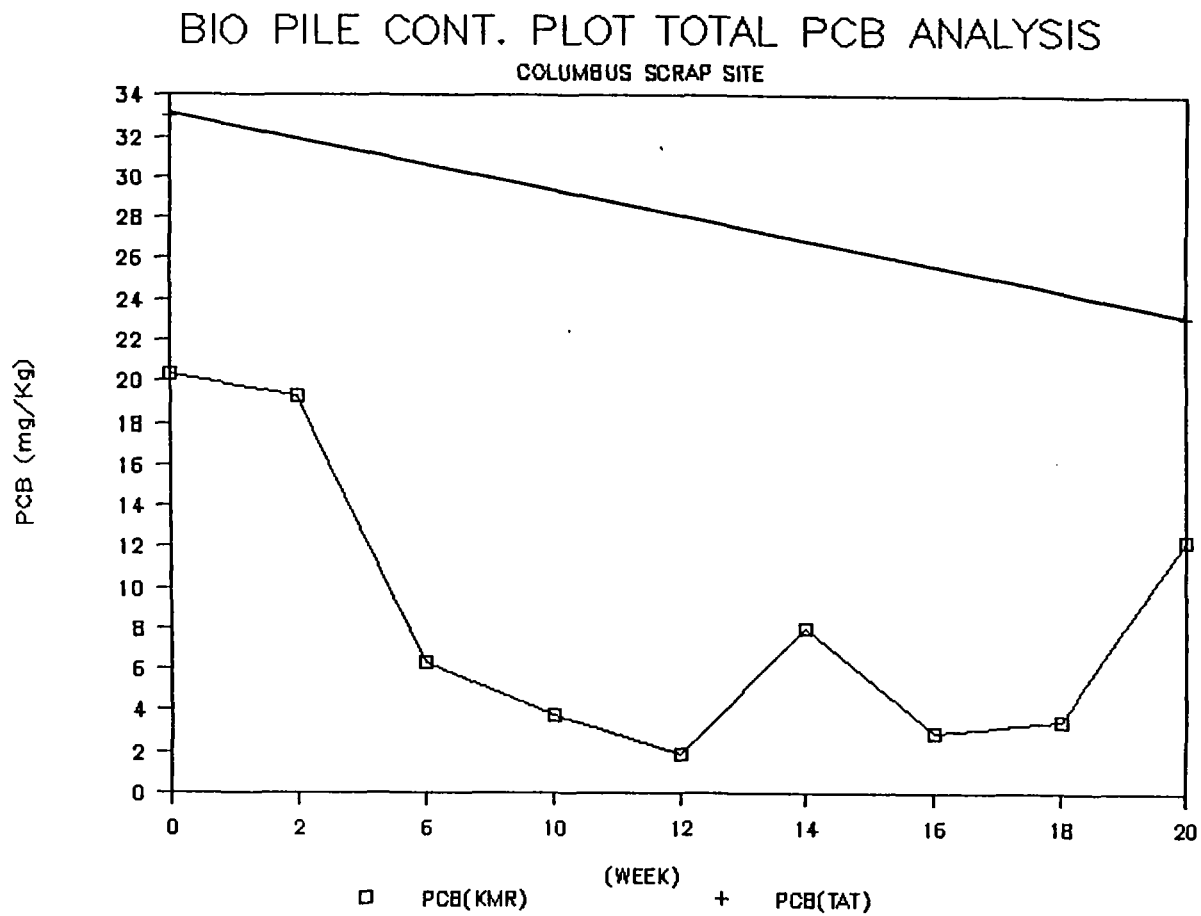


The 20th week value is the average of discrete samples

Treatment Design: Plot #4 soil amended at time 0 and week 2 with wood chips inoculated with fungus, tilled at time 0 and week 2, until week 10 at which time another inoculum will be applied and tilled, untilled for the remainder of the test.

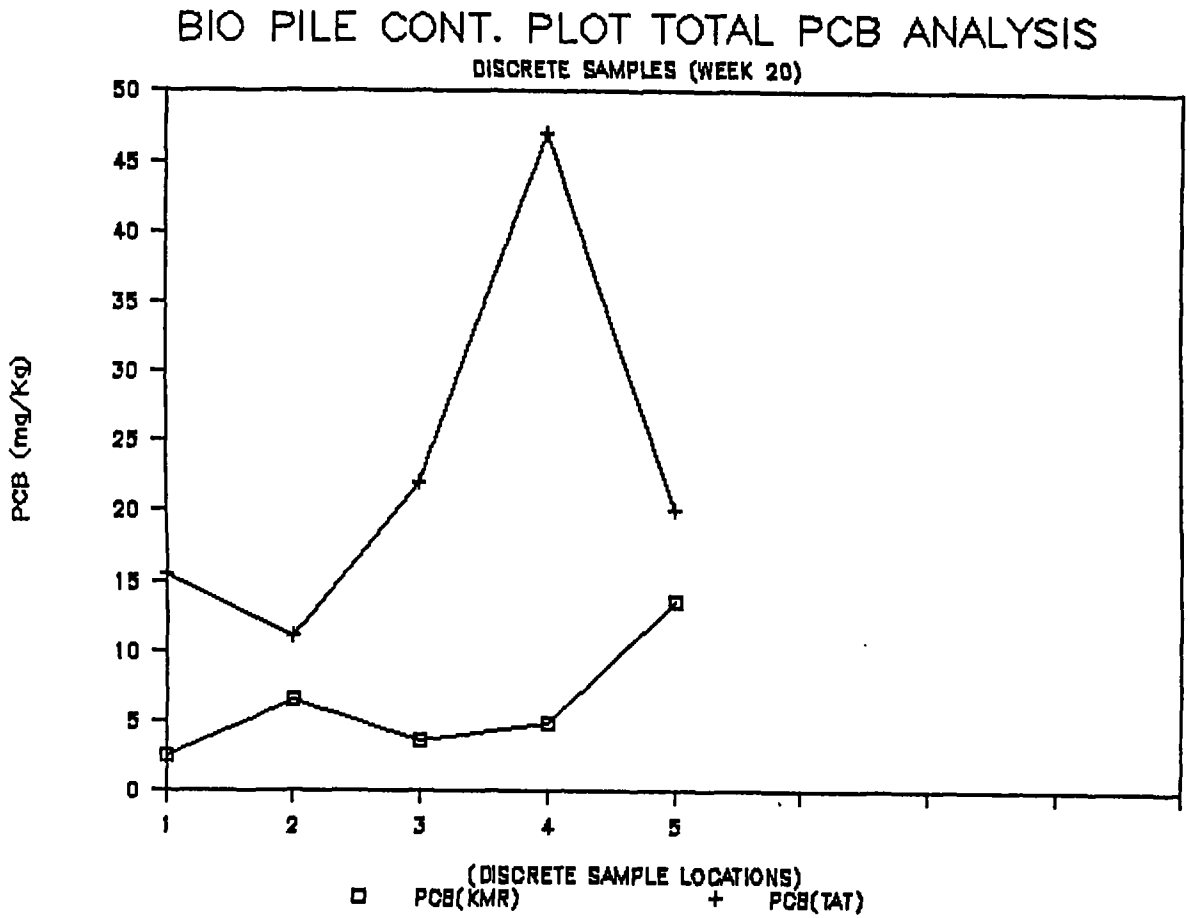


Treatment Design: Plot #5 (soil pile) soil amended at time 0 and week 2 with wood chips inoculated with fungus and tilled at time 0 and week 2 only.

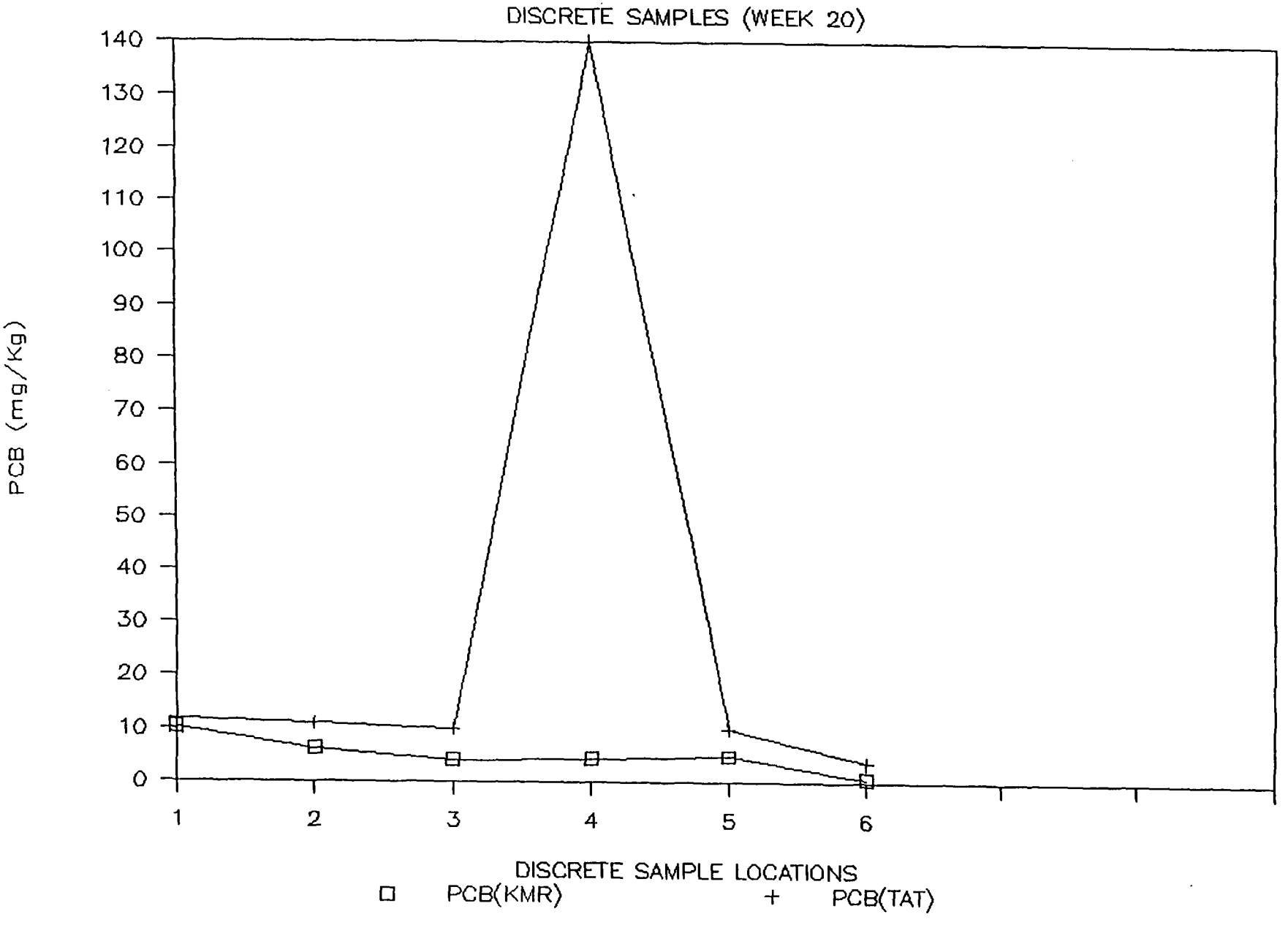


The 20th week value is the average of discrete samples

Treatment Design: Control Plot soil amended with uninoculated wood chips.


BIO PILE CONT. PLOT TOTAL PCB ANALYSIS
DISCRETE SAMPLES (WEEK 20)
PCB (mg/Kg)
50
45
40
35
30
25
20
15
10
5
0
1
2
3
4
5
(DISCRETE SAMPLE LOCATIONS)
PCB(KMR)
PCB(TAT)

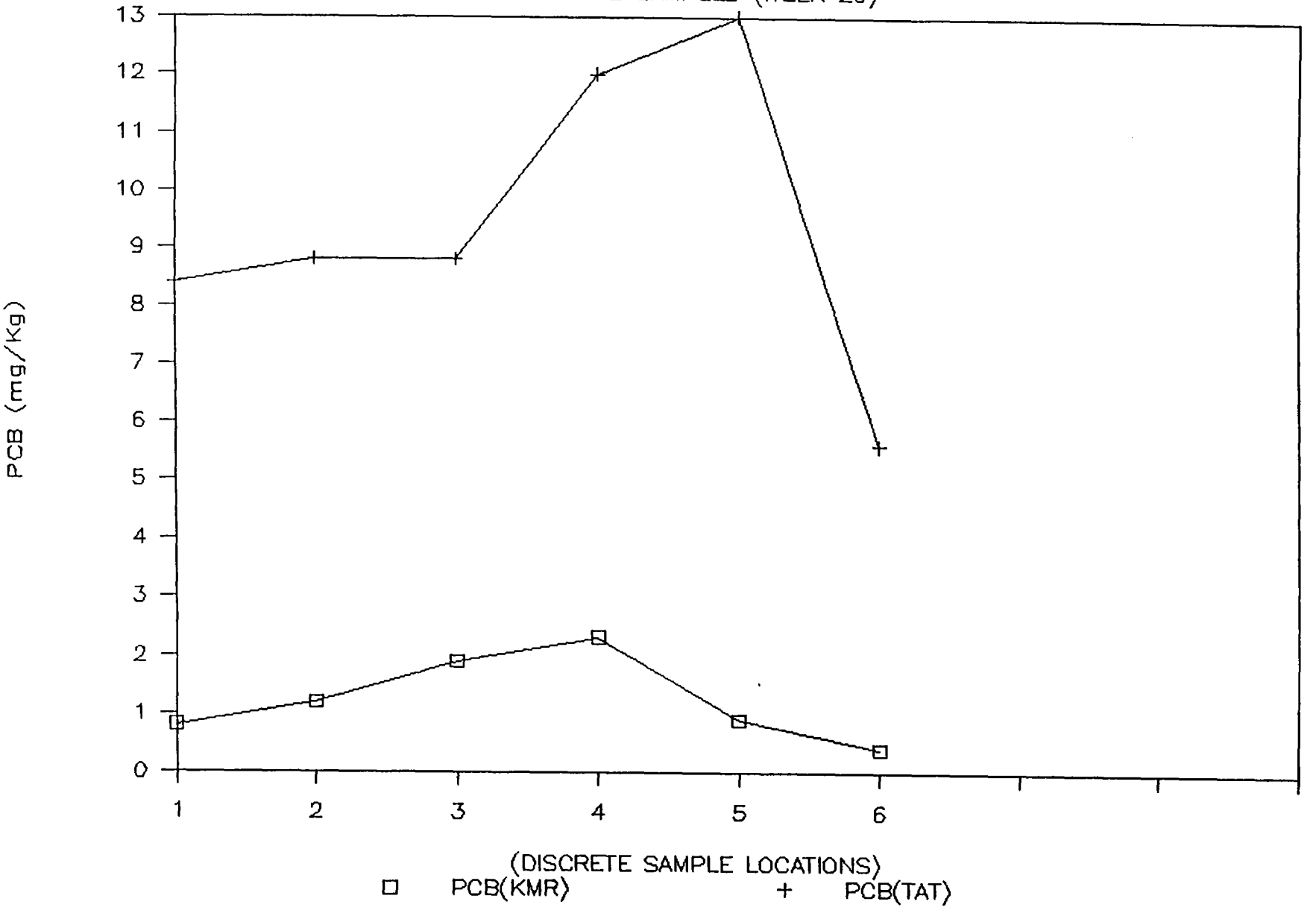
BIO PILE #3 TOTAL PCB ANALYSIS



Location #6 is a composite wood chips sample

BIO PILE #4 TOTAL PCB ANALYSIS

DISCRETE SAMPLES (WEEK 20)



Location #6 is a composite wood chips sample

APPENDIX E

PRP ANALYTICAL DATA

KEMRON
ENVIRONMENTAL SERVICES

2987 Clairmont Road ■ Suite 150 ■ Atlanta, Georgia 30329 ■ Telephone (404) 636-0928 ■ FAX (404) 636-7162

Project 6455

16 July 1993

Mr. Nazeer Uddin
Ecology and Environment, Inc.
6777 Engle Road
Middleburg Heights, OH 44130

RE: Columbus Scrap Metal, Columbus, Ohio

Dear Mr. Uddin:

Per your request, enclosed please find copies of the Week 20 analytical data for the referenced project. Please do not hesistate to contact me at (404) 636-0928 if you have any questions.

Sincerely,
KEMRON Environmental Services, Inc.

Gregory A. Beck
Project Manager

Enclosures

g:6455eco.ltr
07/16/93

USPCI
A Subsidiary of
Union Pacific Corporation

Analytical Services

KEMRON ENVIRONMENTAL
109 STARLITE PARK
MARIETTA OH 45750

ATTENTION: GREG BECK

RE: PROJECT: 6455-107
USPCI-AS REPORT: 5971

Under this cover USPCI Analytical Services is submitting the analytical data for the following samples:

Lab Number	Customer Number
30006661	CP1
30006662	CP2
30006663	CP3
30006664	CP4
30006665	CP5
30006666	TP4-1
30006667	TP4-2
30006668	TP4-3
30006669	TP4-4
30006670	TP4-5
30006671	TP4-WC
30006672	TP3-1
30006673	TP3-2
30006674	TP3-3
30006675	TP3-4
30006676	TP3-5
30006677	TP3-WC
30006678	TP5,1,12"
30006679	TP5,1,24"
30006680	TP5,2,12"
30006681	TP5,2,24"
30006682	TP5,3,12"
30006683	TP5,3,24"
30006684	TP-I 20
30006685	TP-II 20
30006686	TP-III 20
30006687	TP-IV 20

Continued on next page...

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Analytical Services

...Continued from previous page

Lab Number	Customer Number
30006688	CP-20
30006689	SOIL PILE-20
30006690	BACKGROUND OUTSIDE PILE
30006691	TP 4 L/N
30006692	TP 3 L/N

These samples were analyzed using EPA or other recognized methodology as specified in the report. Each test is performed under a rigorous QA/QC program including blanks, method controls and matrix spikes. All methods are calibrated using authentic reference materials with a minimum of a three point calibration curve as appropriate. All practical quantitation limits are validated and reflect method specific or project specific requirements. Some detection limits may be listed as higher than the targeted program limits due to sample specific interferences or limited sample size.

If you need help in evaluating the data or need further information please call the laboratory at 918-446-1162.

Respectfully submitted for
USPCI Analytical Services

James W. Engman
Laboratory Director

4322 South 49th West Avenue • Tulsa, Oklahoma 74107-6100 • 918/446-1162 • Fax 918/445-0945

GREG BECK
KEMRON ENVIRONMENTAL
109 STARLITE PARK
MARIETTA OH 45750

USPCI
A Subsidiary of
Union Pacific Corporation

Analytical Services
SAMPLE IDENTIFICATION: 30006661

CUSTOMER IDENTIFICATION: CP1

PROJECT NUMBER: 6455-107
REPORT NUMBER: 5971
DATE SAMPLED: 06/25/93
TYPE OF MATERIAL: SOLID
DATE RECEIVED: 06/29/93
DATE COMPLETED: 07/07/93

PARAMETER	REFERENCE METHOD	PRACTICAL QUANTITATION LIMIT	RESULT
PCB's			
PCB's - Aroclor 1016	SW 8080	0.25 mg/kg	BDL mg/kg
PCB's - Aroclor 1221	SW 8080	0.25 mg/kg	BDL mg/kg
PCB's - Aroclor 1232	SW 8080	0.25 mg/kg	BDL mg/kg
PCB's - Aroclor 1242	SW 8080	0.25 mg/kg	BDL mg/kg
PCB's - Aroclor 1248	SW 8080	0.25 mg/kg	0.90 mg/kg
PCB's - Aroclor 1254	SW 8080	0.25 mg/kg	1.60 mg/kg
PCB's - Aroclor 1260	SW 8080	0.25 mg/kg	BDL mg/kg
Total PCB's	SW 8080	0.25 mg/kg	2.50 mg/kg

BDL = BELOW QUANTITATION LIMIT % REC = PERCENT RECOVERY (T) = TOTALS
J = VALUE REPORTED BELOW QUANTITATION LIMIT

GREG BECK
KEMRON ENVIRONMENTAL
109 STARLITE PARK
MARIETTA OH 45750

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Analytical Services

SAMPLE IDENTIFICATION: 30006662

CUSTOMER IDENTIFICATION: CP2

PROJECT NUMBER: 6455-107
REPORT NUMBER: 5971
DATE SAMPLED: 06/25/93
TYPE OF MATERIAL: SOLID
DATE RECEIVED: 06/29/93
DATE COMPLETED: 07/07/93

PARAMETER	REFERENCE METHOD	PRACTICAL QUANTITATION LIMIT	RESULT
PCB's			
PCB's - Aroclor 1016	SW 8080	0.25 mg/kg	BDL mg/kg
PCB's - Aroclor 1221	SW 8080	0.25 mg/kg	BDL mg/kg
PCB's - Aroclor 1232	SW 8080	0.25 mg/kg	BDL mg/kg
PCB's - Aroclor 1242	SW 8080	0.25 mg/kg	BDL mg/kg
PCB's - Aroclor 1248	SW 8080	0.25 mg/kg	1.9 mg/kg
PCB's - Aroclor 1254	SW 8080	0.25 mg/kg	4.6 mg/kg
PCB's - Aroclor 1260	SW 8080	0.25 mg/kg	BDL mg/kg
Total PCB's	SW 8080	0.25 mg/kg	6.5 mg/kg

BDL = BELOW QUANTITATION LIMIT % REC = PERCENT RECOVERY (T) = TOTALS
J = VALUE REPORTED BELOW QUANTITATION LIMIT

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MARIETTA OH 45750

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Analytical Services

SAMPLE IDENTIFICATION: 30006663

CUSTOMER IDENTIFICATION: CP3

PROJECT NUMBER: 6455-107
REPORT NUMBER: 5971
DATE SAMPLED: 06/25/93
TYPE OF MATERIAL: SOLID

DATE RECEIVED: 06/29/93
DATE COMPLETED: 07/07/93

PARAMETER	REFERENCE METHOD	PRACTICAL QUANTITATION LIMIT	RESULT
PCB's			
PCB's - Aroclor 1016	SW 8080	0.25 mg/kg	BDL mg/kg
PCB's - Aroclor 1221	SW 8080	0.25 mg/kg	BDL mg/kg
PCB's - Aroclor 1232	SW 8080	0.25 mg/kg	BDL mg/kg
PCB's - Aroclor 1242	SW 8080	0.25 mg/kg	BDL mg/kg
PCB's - Aroclor 1248	SW 8080	0.25 mg/kg	0.90 mg/kg
PCB's - Aroclor 1254	SW 8080	0.25 mg/kg	2.7 mg/kg
PCB's - Aroclor 1260	SW 8080	0.25 mg/kg	BDL mg/kg
Total PCB's	SW 8080	0.25 mg/kg	3.6 mg/kg

BDL = BELOW QUANTITATION LIMIT % REC = PERCENT RECOVERY (T) = TOTALS
J = VALUE REPORTED BELOW QUANTITATION LIMIT

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MARIETTA OH 45750

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Analytical Services

SAMPLE IDENTIFICATION: 30006664

CUSTOMER IDENTIFICATION: CP4

PROJECT NUMBER: 6455-107
REPORT NUMBER: 5971
DATE SAMPLED: 06/25/93
TYPE OF MATERIAL: SOLID

DATE RECEIVED: 06/29/93
DATE COMPLETED: 07/07/93

PARAMETER	REFERENCE METHOD	PRACTICAL QUANTITATION LIMIT	RESULT
PCB's			
PCB's - Aroclor 1016	SW 8080	0.25 mg/kg	BDL mg/kg
PCB's - Aroclor 1221	SW 8080	0.25 mg/kg	BDL mg/kg
PCB's - Aroclor 1232	SW 8080	0.25 mg/kg	BDL mg/kg
PCB's - Aroclor 1242	SW 8080	0.25 mg/kg	BDL mg/kg
PCB's - Aroclor 1248	SW 8080	0.25 mg/kg	1.5 mg/kg
PCB's - Aroclor 1254	SW 8080	0.25 mg/kg	3.3 mg/kg
PCB's - Aroclor 1260	SW 8080	0.25 mg/kg	BDL mg/kg
Total PCB's	SW 8080	0.25 mg/kg	4.8 mg/kg

BDL = BELOW QUANTITATION LIMIT % REC = PERCENT RECOVERY (T) = TOTALS
J = VALUE REPORTED BELOW QUANTITATION LIMIT

GREG BECK
KEMRON ENVIRONMENTAL
109 STARLITE PARK
MARIETTA OH 45750

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Analytical Services
SAMPLE IDENTIFICATION: 30006665

CUSTOMER IDENTIFICATION: CP5

PROJECT NUMBER: 6455-107
REPORT NUMBER: 5971
DATE SAMPLED: 06/25/93
TYPE OF MATERIAL: SOLID

DATE RECEIVED: 06/29/93
DATE COMPLETED: 07/07/93

PARAMETER	REFERENCE METHOD	PRACTICAL QUANTITATION LIMIT	RESULT
PCB's			
PCB's - Aroclor 1016	SW 8080	0.25 mg/kg	BDL mg/kg
PCB's - Aroclor 1221	SW 8080	0.25 mg/kg	BDL mg/kg
PCB's - Aroclor 1232	SW 8080	0.25 mg/kg	BDL mg/kg
PCB's - Aroclor 1242	SW 8080	0.25 mg/kg	BDL mg/kg
PCB's - Aroclor 1248	SW 8080	0.25 mg/kg	1.6 mg/kg
PCB's - Aroclor 1254	SW 8080	0.25 mg/kg	11.9 mg/kg
PCB's - Aroclor 1260	SW 8080	0.25 mg/kg	BDL mg/kg
Total PCB's	SW 8080	0.25 mg/kg	13.5 mg/kg

BDL = BELOW QUANTITATION LIMIT % REC = PERCENT RECOVERY (T) = TOTALS
J = VALUE REPORTED BELOW QUANTITATION LIMIT

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109 STARLITE PARK
MARIETTA OH 45750

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Analytical Services
SAMPLE IDENTIFICATION: 30006666

CUSTOMER IDENTIFICATION: TP4-1

PROJECT NUMBER: 6455-107
REPORT NUMBER: 5971
DATE SAMPLED: 06/25/93
TYPE OF MATERIAL: SOLID

DATE RECEIVED: 06/29/93
DATE COMPLETED: 07/07/93

PARAMETER	REFERENCE METHOD	PRACTICAL QUANTITATION LIMIT	RESULT
PCB's			
PCB's - Aroclor 1016	SW 8080	0.25 mg/kg	BDL mg/kg
PCB's - Aroclor 1221	SW 8080	0.25 mg/kg	BDL mg/kg
PCB's - Aroclor 1232	SW 8080	0.25 mg/kg	BDL mg/kg
PCB's - Aroclor 1242	SW 8080	0.25 mg/kg	BDL mg/kg
PCB's - Aroclor 1248	SW 8080	0.25 mg/kg	0.3 mg/kg
PCB's - Aroclor 1254	SW 8080	0.25 mg/kg	0.5 mg/kg
PCB's - Aroclor 1260	SW 8080	0.25 mg/kg	BDL mg/kg
Total PCB's	SW 8080	0.25 mg/kg	0.8 mg/kg

BDL = BELOW QUANTITATION LIMIT % REC = PERCENT RECOVERY (T) = TOTALS
J = VALUE REPORTED BELOW QUANTITATION LIMIT

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MARIETTA OH 45750

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SAMPLE IDENTIFICATION: 30006667

CUSTOMER IDENTIFICATION: TP4-2

PROJECT NUMBER: 6455-107
REPORT NUMBER: 5971
DATE SAMPLED: 06/25/93
TYPE OF MATERIAL: SOLID

DATE RECEIVED: 06/29/93
DATE COMPLETED: 07/07/93

PARAMETER	REFERENCE METHOD	PRACTICAL QUANTITATION LIMIT	RESULT
PCB's			
PCB's - Aroclor 1016	SW 8080	0.25 mg/kg	BDL mg/kg
PCB's - Aroclor 1221	SW 8080	0.25 mg/kg	BDL mg/kg
PCB's - Aroclor 1232	SW 8080	0.25 mg/kg	BDL mg/kg
PCB's - Aroclor 1242	SW 8080	0.25 mg/kg	BDL mg/kg
PCB's - Aroclor 1248	SW 8080	0.25 mg/kg	0.4 mg/kg
PCB's - Aroclor 1254	SW 8080	0.25 mg/kg	0.8 mg/kg
PCB's - Aroclor 1260	SW 8080	0.25 mg/kg	BDL mg/kg
Total PCB's	SW 8080	0.25 mg/kg	1.2 mg/kg

BDL = BELOW QUANTITATION LIMIT % REC = PERCENT RECOVERY (T) = TOTALS
J = VALUE REPORTED BELOW QUANTITATION LIMIT

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109 STARLITE PARK
MARIETTA OH 45750

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SAMPLE IDENTIFICATION: 30006668

CUSTOMER IDENTIFICATION: TP4-3

PROJECT NUMBER: 6455-107
REPORT NUMBER: 5971
DATE SAMPLED: 06/25/93
TYPE OF MATERIAL: SOLID

DATE RECEIVED: 06/29/93
DATE COMPLETED: 07/07/93

PARAMETER	REFERENCE METHOD	PRACTICAL QUANTITATION LIMIT	RESULT
PCB's			
PCB's - Aroclor 1016	SW 8080	0.25 mg/kg	BDL mg/kg
PCB's - Aroclor 1221	SW 8080	0.25 mg/kg	BDL mg/kg
PCB's - Aroclor 1232	SW 8080	0.25 mg/kg	BDL mg/kg
PCB's - Aroclor 1242	SW 8080	0.25 mg/kg	BDL mg/kg
PCB's - Aroclor 1248	SW 8080	0.25 mg/kg	0.7 mg/kg
PCB's - Aroclor 1254	SW 8080	0.25 mg/kg	1.2 mg/kg
PCB's - Aroclor 1260	SW 8080	0.25 mg/kg	BDL mg/kg
Total PCB's	SW 8080	0.25 mg/kg	1.9 mg/kg

BDL = BELOW QUANTITATION LIMIT % REC = PERCENT RECOVERY (T) = TOTALS
J = VALUE REPORTED BELOW QUANTITATION LIMIT

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KEMRON ENVIRONMENTAL
109 STARLITE PARK
MARIETTA OH 45750

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SAMPLE IDENTIFICATION: 30006669

CUSTOMER IDENTIFICATION: TP4-4

PROJECT NUMBER: 6455-107
REPORT NUMBER: 5971
DATE SAMPLED: 06/25/93
TYPE OF MATERIAL: SOLID

DATE RECEIVED: 06/29/93
DATE COMPLETED: 07/07/93

PARAMETER	REFERENCE METHOD	PRACTICAL QUANTITATION LIMIT	RESULT
PCB's			
PCB's - Aroclor 1016	SW 8080	0.25 mg/kg	BDL mg/kg
PCB's - Aroclor 1221	SW 8080	0.25 mg/kg	BDL mg/kg
PCB's - Aroclor 1232	SW 8080	0.25 mg/kg	BDL mg/kg
PCB's - Aroclor 1242	SW 8080	0.25 mg/kg	BDL mg/kg
PCB's - Aroclor 1248	SW 8080	0.25 mg/kg	1.0 mg/kg
PCB's - Aroclor 1254	SW 8080	0.25 mg/kg	1.3 mg/kg
PCB's - Aroclor 1260	SW 8080	0.25 mg/kg	BDL mg/kg
Total PCB's	SW 8080	0.25 mg/kg	2.3 mg/kg

BDL = BELOW QUANTITATION LIMIT % REC = PERCENT RECOVERY (T) = TOTALS
J = VALUE REPORTED BELOW QUANTITATION LIMIT

GREG BECK
KEMRON ENVIRONMENTAL
109 STARLITE PARK
MARIETTA OH 45750

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Union Pacific Corporation

Analytical Services

SAMPLE IDENTIFICATION: 30006670

CUSTOMER IDENTIFICATION: TP4-5

PROJECT NUMBER: 6455-107
REPORT NUMBER: 5971
DATE SAMPLED: 06/25/93
TYPE OF MATERIAL: SOLID

DATE RECEIVED: 06/29/93
DATE COMPLETED: 07/07/93

PARAMETER	REFERENCE METHOD	PRACTICAL QUANTITATION LIMIT	RESULT
PCB's			
PCB's - Aroclor 1016	SW 8080	0.25 mg/kg	BDL mg/kg
PCB's - Aroclor 1221	SW 8080	0.25 mg/kg	BDL mg/kg
PCB's - Aroclor 1232	SW 8080	0.25 mg/kg	BDL mg/kg
PCB's - Aroclor 1242	SW 8080	0.25 mg/kg	BDL mg/kg
PCB's - Aroclor 1248	SW 8080	0.25 mg/kg	0.3 mg/kg
PCB's - Aroclor 1254	SW 8080	0.25 mg/kg	0.6 mg/kg
PCB's - Aroclor 1260	SW 8080	0.25 mg/kg	BDL mg/kg
Total PCB's	SW 8080	0.25 mg/kg	0.9 mg/kg

BDL = BELOW QUANTITATION LIMIT % REC = PERCENT RECOVERY (T) = TOTALS
J = VALUE REPORTED BELOW QUANTITATION LIMIT

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Analytical Services
SAMPLE IDENTIFICATION: 30006671

CUSTOMER IDENTIFICATION: TP4-WC

PROJECT NUMBER: 6455-107
REPORT NUMBER: 5971
DATE SAMPLED: 06/25/93
TYPE OF MATERIAL: SOLID
DATE RECEIVED: 06/29/93
DATE COMPLETED: 07/07/93

PARAMETER	REFERENCE METHOD	PRACTICAL QUANTITATION LIMIT	RESULT	
PCB's				
PCB's - Aroclor 1016	SW 8080	0.25 mg/kg	BDL mg/kg	
PCB's - Aroclor 1221	SW 8080	0.25 mg/kg	BDL mg/kg	
PCB's - Aroclor 1232	SW 8080	0.25 mg/kg	BDL mg/kg	
PCB's - Aroclor 1242	SW 8080	0.25 mg/kg	BDL mg/kg	
PCB's - Aroclor 1248	SW 8080	0.25 mg/kg	0.1 mg/kg	J
PCB's - Aroclor 1254	SW 8080	0.25 mg/kg	0.3 mg/kg	
PCB's - Aroclor 1260	SW 8080	0.25 mg/kg	BDL mg/kg	
Total PCB's	SW 8080	0.25 mg/kg	0.4 mg/kg	

BDL = BELOW QUANTITATION LIMIT % REC = PERCENT RECOVERY (T) = TOTALS
J = VALUE REPORTED BELOW QUANTITATION LIMIT

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Analytical Services
SAMPLE IDENTIFICATION: 30006672

CUSTOMER IDENTIFICATION: TP3-1

PROJECT NUMBER: 6455-107
REPORT NUMBER: 5971
DATE SAMPLED: 06/25/93
TYPE OF MATERIAL: SOLID

DATE RECEIVED: 06/29/93
DATE COMPLETED: 07/07/93

PARAMETER	REFERENCE METHOD	PRACTICAL QUANTITATION LIMIT	RESULT
PCB's			
PCB's - Aroclor 1016	SW 8080	0.25 mg/kg	BDL mg/kg
PCB's - Aroclor 1221	SW 8080	0.25 mg/kg	BDL mg/kg
PCB's - Aroclor 1232	SW 8080	0.25 mg/kg	BDL mg/kg
PCB's - Aroclor 1242	SW 8080	0.25 mg/kg	BDL mg/kg
PCB's - Aroclor 1248	SW 8080	0.25 mg/kg	5.3 mg/kg
PCB's - Aroclor 1254	SW 8080	0.25 mg/kg	5.0 mg/kg
PCB's - Aroclor 1260	SW 8080	0.25 mg/kg	BDL mg/kg
Total PCB's	SW 8080	0.25 mg/kg	10.3 mg/kg

BDL = BELOW QUANTITATION LIMIT % REC = PERCENT RECOVERY (T) = TOTALS
J = VALUE REPORTED BELOW QUANTITATION LIMIT

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Analytical Services

SAMPLE IDENTIFICATION: 30006673

CUSTOMER IDENTIFICATION: TP3-2

PROJECT NUMBER: 6455-107
REPORT NUMBER: 5971
DATE SAMPLED: 06/25/93
TYPE OF MATERIAL: SOLID

DATE RECEIVED: 06/29/93
DATE COMPLETED: 07/07/93

PARAMETER	REFERENCE METHOD	PRACTICAL QUANTITATION LIMIT	RESULT
PCB's			
PCB's - Aroclor 1016	SW 8080	0.25 mg/kg	BDL mg/kg
PCB's - Aroclor 1221	SW 8080	0.25 mg/kg	BDL mg/kg
PCB's - Aroclor 1232	SW 8080	0.25 mg/kg	BDL mg/kg
PCB's - Aroclor 1242	SW 8080	0.25 mg/kg	BDL mg/kg
PCB's - Aroclor 1248	SW 8080	0.25 mg/kg	1.5 mg/kg
PCB's - Aroclor 1254	SW 8080	0.25 mg/kg	5.0 mg/kg
PCB's - Aroclor 1260	SW 8080	0.25 mg/kg	BDL mg/kg
Total PCB's	SW 8080	0.25 mg/kg	6.5 mg/kg

BDL = BELOW QUANTITATION LIMIT % REC = PERCENT RECOVERY (T) = TOTALS
J = VALUE REPORTED BELOW QUANTITATION LIMIT

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SAMPLE IDENTIFICATION: 30006674

CUSTOMER IDENTIFICATION: TP3-3

PROJECT NUMBER: 6455-107
REPORT NUMBER: 5971
DATE SAMPLED: 06/25/93
TYPE OF MATERIAL: SOLID

DATE RECEIVED: 06/29/93
DATE COMPLETED: 07/07/93

PARAMETER	REFERENCE METHOD	PRACTICAL QUANTITATION LIMIT	RESULT
PCB's			
PCB's - Aroclor 1016	SW 8080	0.25 mg/kg	BDL mg/kg
PCB's - Aroclor 1221	SW 3080	0.25 mg/kg	BDL mg/kg
PCB's - Aroclor 1232	SW 8080	0.25 mg/kg	BDL mg/kg
PCB's - Aroclor 1242	SW 8080	0.25 mg/kg	BDL mg/kg
PCB's - Aroclor 1248	SW 8080	0.25 mg/kg	1.0 mg/kg
PCB's - Aroclor 1254	SW 8080	0.25 mg/kg	3.1 mg/kg
PCB's - Aroclor 1260	SW 8080	0.25 mg/kg	BDL mg/kg
Total PCB's	SW 8080	0.25 mg/kg	4.1 mg/kg

BDL = BELOW QUANTITATION LIMIT % REC = PERCENT RECOVERY (T) = TOTALS
J = VALUE REPORTED BELOW QUANTITATION LIMIT

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Analytical Services
SAMPLE IDENTIFICATION: 30006675

CUSTOMER IDENTIFICATION: TP3-4

PROJECT NUMBER: 6455-107
REPORT NUMBER: 5971
DATE SAMPLED: 06/25/93
TYPE OF MATERIAL: SOLID
DATE RECEIVED: 06/29/93
DATE COMPLETED: 07/07/93

PARAMETER	REFERENCE METHOD	PRACTICAL QUANTITATION LIMIT	RESULT
PCB's			
PCB's - Aroclor 1016	SW 8080	0.25 mg/kg	BDL mg/kg
PCB's - Aroclor 1221	SW 8080	0.25 mg/kg	BDL mg/kg
PCB's - Aroclor 1232	SW 8080	0.25 mg/kg	BDL mg/kg
PCB's - Aroclor 1242	SW 8080	0.25 mg/kg	BDL mg/kg
PCB's - Aroclor 1248	SW 8080	0.25 mg/kg	1.0 mg/kg
PCB's - Aroclor 1254	SW 8080	0.25 mg/kg	3.4 mg/kg
PCB's - Aroclor 1260	SW 8080	0.25 mg/kg	BDL mg/kg
Total PCB's	SW 8080	0.25 mg/kg	4.4 mg/kg

BDL = BELOW QUANTITATION LIMIT % REC = PERCENT RECOVERY (T) = TOTALS
J = VALUE REPORTED BELOW QUANTITATION LIMIT

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Analytical Services
SAMPLE IDENTIFICATION: 30006676

CUSTOMER IDENTIFICATION: TP3-5

PROJECT NUMBER: 6455-107
REPORT NUMBER: 5971
DATE SAMPLED: 06/25/93
TYPE OF MATERIAL: SOLID
DATE RECEIVED: 06/29/93
DATE COMPLETED: 07/07/93

PARAMETER	REFERENCE METHOD	PRACTICAL QUANTITATION LIMIT	RESULT
PCB's			
PCB's - Aroclor 1016	SW 8080	0.25 mg/kg	BDL mg/kg
PCB's - Aroclor 1221	SW 8080	0.25 mg/kg	BDL mg/kg
PCB's - Aroclor 1232	SW 8080	0.25 mg/kg	BDL mg/kg
PCB's - Aroclor 1242	SW 8080	0.25 mg/kg	BDL mg/kg
PCB's - Aroclor 1248	SW 8080	0.25 mg/kg	0.5 mg/kg
PCB's - Aroclor 1254	SW 8080	0.25 mg/kg	4.4 mg/kg
PCB's - Aroclor 1260	SW 8080	0.25 mg/kg	BDL mg/kg
Total PCB's	SW 8080	0.25 mg/kg	4.9 mg/kg

BDL = BELOW QUANTITATION LIMIT % REC = PERCENT RECOVERY (T) = TOTALS
J = VALUE REPORTED BELOW QUANTITATION LIMIT

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Analytical Services
SAMPLE IDENTIFICATION: 30006677

CUSTOMER IDENTIFICATION: TP3-WC

PROJECT NUMBER: 6455-107
REPORT NUMBER: 5971
DATE SAMPLED: 06/25/93
TYPE OF MATERIAL: SOLID
DATE RECEIVED: 06/29/93
DATE COMPLETED: 07/07/93

PARAMETER	REFERENCE METHOD	PRACTICAL QUANTITATION LIMIT	RESULT
PCB's			
PCB's - Aroclor 1016	SW 8080	0.25 mg/kg	BDL mg/kg
PCB's - Aroclor 1221	SW 8080	0.25 mg/kg	BDL mg/kg
PCB's - Aroclor 1232	SW 8080	0.25 mg/kg	BDL mg/kg
PCB's - Aroclor 1242	SW 8080	0.25 mg/kg	BDL mg/kg
PCB's - Aroclor 1248	SW 8080	0.25 mg/kg	BDL mg/kg
PCB's - Aroclor 1254	SW 8080	0.25 mg/kg	0.60 mg/kg
PCB's - Aroclor 1260	SW 8080	0.25 mg/kg	BDL mg/kg
Total PCB's	SW 8080	0.25 mg/kg	0.60 mg/kg

BDL = BELOW QUANTITATION LIMIT % REC = PERCENT RECOVERY (T) = TOTALS
J = VALUE REPORTED BELOW QUANTITATION LIMIT

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Analytical Services
SAMPLE IDENTIFICATION: 30006678

CUSTOMER IDENTIFICATION: TP5,1,12"

PROJECT NUMBER: 6455-107
REPORT NUMBER: 5971
DATE SAMPLED: 06/25/93
TYPE OF MATERIAL: SOLID

DATE RECEIVED: 06/29/93
DATE COMPLETED: 07/07/93

PARAMETER	REFERENCE METHOD	PRACTICAL QUANTITATION LIMIT	RESULT
PCB's			
PCB's - Aroclor 1016	SW 3080	0.25 mg/kg	BDL mg/kg
PCB's - Aroclor 1221	SW 8080	0.25 mg/kg	BDL mg/kg
PCB's - Aroclor 1232	SW 8080	0.25 mg/kg	BDL mg/kg
PCB's - Aroclor 1242	SW 8080	0.25 mg/kg	BDL mg/kg
PCB's - Aroclor 1248	SW 8080	0.25 mg/kg	0.4 mg/kg
PCB's - Aroclor 1254	SW 8080	0.25 mg/kg	4.4 mg/kg
PCB's - Aroclor 1260	SW 8080	0.25 mg/kg	BDL mg/kg
Total PCB's	SW 8080	0.25 mg/kg	4.8 mg/kg

BDL = BELOW QUANTITATION LIMIT % REC = PERCENT RECOVERY (T) = TOTALS
J = VALUE REPORTED BELOW QUANTITATION LIMIT

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Analytical Services
SAMPLE IDENTIFICATION: 30006679

CUSTOMER IDENTIFICATION: TP5,1,24"

PROJECT NUMBER: 6455-107
REPORT NUMBER: 5971
DATE SAMPLED: 06/25/93
TYPE OF MATERIAL: SOLID

DATE RECEIVED: 06/29/93
DATE COMPLETED: 07/07/93

PARAMETER	REFERENCE METHOD	PRACTICAL QUANTITATION LIMIT	RESULT
PCB's			
PCB's - Aroclor 1016	SW 8080	0.25 mg/kg	BDL mg/kg
PCB's - Aroclor 1221	SW 8080	0.25 mg/kg	BDL mg/kg
PCB's - Aroclor 1232	SW 8080	0.25 mg/kg	BDL mg/kg
PCB's - Aroclor 1242	SW 8080	0.25 mg/kg	BDL mg/kg
PCB's - Aroclor 1248	SW 8080	0.25 mg/kg	2.0 mg/kg
PCB's - Aroclor 1254	SW 8080	0.25 mg/kg	7.3 mg/kg
PCB's - Aroclor 1260	SW 8080	0.25 mg/kg	BDL mg/kg
Total PCB's	SW 8080	0.25 mg/kg	9.3 mg/kg

BDL = BELOW QUANTITATION LIMIT % REC = PERCENT RECOVERY (T) = TOTALS
J = VALUE REPORTED BELOW QUANTITATION LIMIT

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Analytical Services
SAMPLE IDENTIFICATION: 30006680

CUSTOMER IDENTIFICATION: TP5,2,12"

PROJECT NUMBER: 6455-107
REPORT NUMBER: 5971
DATE SAMPLED: 06/25/93
TYPE OF MATERIAL: SOLID

DATE RECEIVED: 06/29/93
DATE COMPLETED: 07/07/93

PARAMETER	REFERENCE METHOD	PRACTICAL QUANTITATION LIMIT	RESULT
PCB's			
PCB's - Aroclor 1016	SW 8080	0.25 mg/kg	BDL mg/kg
PCB's - Aroclor 1221	SW 8080	0.25 mg/kg	BDL mg/kg
PCB's - Aroclor 1232	SW 8080	0.25 mg/kg	BDL mg/kg
PCB's - Aroclor 1242	SW 8080	0.25 mg/kg	BDL mg/kg
PCB's - Aroclor 1248	SW 8080	0.25 mg/kg	2.1 mg/kg
PCB's - Aroclor 1254	SW 8080	0.25 mg/kg	8.4 mg/kg
PCB's - Aroclor 1260	SW 8080	0.25 mg/kg	BDL mg/kg
Total PCB's	SW 8080	0.25 mg/kg	10.5 mg/kg

BDL = BELOW QUANTITATION LIMIT % REC = PERCENT RECOVERY (T) = TOTALS
J = VALUE REPORTED BELOW QUANTITATION LIMIT

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Analytical Services

SAMPLE IDENTIFICATION: 30006681

CUSTOMER IDENTIFICATION: TP5,2,24"

PROJECT NUMBER: 6455-107
REPORT NUMBER: 5971
DATE SAMPLED: 06/25/93
TYPE OF MATERIAL: SOLID

DATE RECEIVED: 06/29/93
DATE COMPLETED: 07/07/93

PARAMETER	REFERENCE METHOD	PRACTICAL QUANTITATION LIMIT	RESULT
PCB's			
PCB's - Aroclor 1016	SW 8080	0.25 mg/kg	BDL mg/kg
PCB's - Aroclor 1221	SW 8080	0.25 mg/kg	BDL mg/kg
PCB's - Aroclor 1232	SW 8080	0.25 mg/kg	BDL mg/kg
PCB's - Aroclor 1242	SW 8080	0.25 mg/kg	BDL mg/kg
PCB's - Aroclor 1248	SW 8080	0.25 mg/kg	1.6 mg/kg
PCB's - Aroclor 1254	SW 8080	0.25 mg/kg	6.7 mg/kg
PCB's - Aroclor 1260	SW 8080	0.25 mg/kg	BDL mg/kg
Total PCB's	SW 8080	0.25 mg/kg	8.3 mg/kg

BDL = BELOW QUANTITATION LIMIT % REC = PERCENT RECOVERY (T) = TOTALS
J = VALUE REPORTED BELOW QUANTITATION LIMIT

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Analytical Services
SAMPLE IDENTIFICATION: 30006682

CUSTOMER IDENTIFICATION: TP5,3,12"

PROJECT NUMBER: 6455-107
REPORT NUMBER: 5971
DATE SAMPLED: 06/25/93
TYPE OF MATERIAL: SOLID

DATE RECEIVED: 06/29/93
DATE COMPLETED: 07/07/93

PARAMETER	REFERENCE METHOD	PRACTICAL QUANTITATION LIMIT	RESULT
PCB's			
PCB's - Aroclor 1016	SW 8080	0.25 mg/kg	BDL mg/kg
PCB's - Aroclor 1221	SW 8080	0.25 mg/kg	BDL mg/kg
PCB's - Aroclor 1232	SW 8080	0.25 mg/kg	BDL mg/kg
PCB's - Aroclor 1242	SW 8080	0.25 mg/kg	BDL mg/kg
PCB's - Aroclor 1248	SW 8080	0.25 mg/kg	4.3 mg/kg
PCB's - Aroclor 1254	SW 8080	0.25 mg/kg	6.9 mg/kg
PCB's - Aroclor 1260	SW 8080	0.25 mg/kg	BDL mg/kg
Total PCB's	SW 8080	0.25 mg/kg	11.2 mg/kg

BDL = BELOW QUANTITATION LIMIT % REC = PERCENT RECOVERY (T) = TOTALS
J = VALUE REPORTED BELOW QUANTITATION LIMIT

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Analytical Services

SAMPLE IDENTIFICATION: 30006683

CUSTOMER IDENTIFICATION: TP5,3,24"

PROJECT NUMBER: 6455-107
REPORT NUMBER: 5971
DATE SAMPLED: 06/25/93
TYPE OF MATERIAL: SOLID

DATE RECEIVED: 06/29/93
DATE COMPLETED: 07/07/93

PARAMETER	REFERENCE METHOD	PRACTICAL QUANTITATION LIMIT	RESULT
PCB's			
PCB's - Aroclor 1016	SW 8080	0.25 mg/kg	BDL mg/kg
PCB's - Aroclor 1221	SW 8080	0.25 mg/kg	BDL mg/kg
PCB's - Aroclor 1232	SW 8080	0.25 mg/kg	BDL mg/kg
PCB's - Aroclor 1242	SW 8080	0.25 mg/kg	BDL mg/kg
PCB's - Aroclor 1248	SW 8080	0.25 mg/kg	2.4 mg/kg
PCB's - Aroclor 1254	SW 8080	0.25 mg/kg	4.4 mg/kg
PCB's - Aroclor 1260	SW 8080	0.25 mg/kg	BDL mg/kg
Total PCB's	SW 8080	0.25 mg/kg	6.8 mg/kg

BDL = BELOW QUANTITATION LIMIT % REC = PERCENT RECOVERY (T) = TOTALS
J = VALUE REPORTED BELOW QUANTITATION LIMIT

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Analytical Services

SAMPLE IDENTIFICATION: 30006684

CUSTOMER IDENTIFICATION: TP-I 20

PROJECT NUMBER: 6455-107
REPORT NUMBER: 5971
DATE SAMPLED: 06/25/93
TYPE OF MATERIAL: SOLID

DATE RECEIVED: 06/29/93
DATE COMPLETED: 07/07/93

PARAMETER	REFERENCE METHOD	PRACTICAL QUANTITATION LIMIT	RESULT
PCB's			
PCB's - Aroclor 1016	SW 808C	0.25 mg/kg	BDL mg/kg
PCB's - Aroclor 1221	SW 8080	0.25 mg/kg	BDL mg/kg
PCB's - Aroclor 1232	SW 8080	0.25 mg/kg	BDL mg/kg
PCB's - Aroclor 1242	SW 8080	0.25 mg/kg	BDL mg/kg
PCB's - Aroclor 1248	SW 8080	0.25 mg/kg	3.9 mg/kg
PCB's - Aroclor 1254	SW 8080	0.25 mg/kg	5.3 mg/kg
PCB's - Aroclor 1260	SW 8080	0.25 mg/kg	BDL mg/kg
Total PCB's	SW 8080	0.25 mg/kg	9.2 mg/kg

BDL = BELOW QUANTITATION LIMIT % REC = PERCENT RECOVERY (T) = TOTALS
J = VALUE REPORTED BELOW QUANTITATION LIMIT

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Analytical Services
SAMPLE IDENTIFICATION: 30006685

CUSTOMER IDENTIFICATION: TP-II 20

PROJECT NUMBER: 6455-107
REPORT NUMBER: 5971
DATE SAMPLED: 06/25/93
TYPE OF MATERIAL: SOLID
DATE RECEIVED: 06/29/93
DATE COMPLETED: 07/07/93

PARAMETER	REFERENCE METHOD	PRACTICAL QUANTITATION LIMIT	RESULT
PCB's			
PCB's - Aroclor 1016	SW 8080	0.25 mg/kg	BDL mg/kg
PCB's - Aroclor 1221	SW 8080	0.25 mg/kg	BDL mg/kg
PCB's - Aroclor 1232	SW 8080	0.25 mg/kg	BDL mg/kg
PCB's - Aroclor 1242	SW 8080	0.25 mg/kg	BDL mg/kg
PCB's - Aroclor 1248	SW 8080	0.25 mg/kg	2.8 mg/kg
PCB's - Aroclor 1254	SW 8080	0.25 mg/kg	4.2 mg/kg
PCB's - Aroclor 1260	SW 8080	0.25 mg/kg	BDL mg/kg
Total PCB's	SW 8080	0.25 mg/kg	7.0 mg/kg

BDL = BELOW QUANTITATION LIMIT % REC = PERCENT RECOVERY (T) = TOTALS
J = VALUE REPORTED BELOW QUANTITATION LIMIT

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Analytical Services
SAMPLE IDENTIFICATION: 30006686

CUSTOMER IDENTIFICATION: TP-III 20

PROJECT NUMBER: 6455-107
REPORT NUMBER: 5971
DATE SAMPLED: 06/25/93
TYPE OF MATERIAL: SOLID

DATE RECEIVED: 06/29/93
DATE COMPLETED: 07/07/93

PARAMETER	REFERENCE METHOD	PRACTICAL QUANTITATION LIMIT	RESULT
PCB's			
PCB's - Aroclor 1016	SW 8080	0.25 mg/kg	BDL mg/kg
PCB's - Aroclor 1221	SW 8080	0.25 mg/kg	BDL mg/kg
PCB's - Aroclor 1232	SW 8080	0.25 mg/kg	BDL mg/kg
PCB's - Aroclor 1242	SW 8080	0.25 mg/kg	BDL mg/kg
PCB's - Aroclor 1248	SW 8080	0.25 mg/kg	5.0 mg/kg
PCB's - Aroclor 1254	SW 8080	0.25 mg/kg	5.4 mg/kg
PCB's - Aroclor 1260	SW 8080	0.25 mg/kg	BDL mg/kg
Total PCB's	SW 8080	0.25 mg/kg	10.4 mg/kg

BDL = BELOW QUANTITATION LIMIT % REC = PERCENT RECOVERY (T) = TOTALS
J = VALUE REPORTED BELOW QUANTITATION LIMIT

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Analytical Services

SAMPLE IDENTIFICATION: 30006687

CUSTOMER IDENTIFICATION: TP-IV 20

PROJECT NUMBER: 6455-107
REPORT NUMBER: 5971
DATE SAMPLED: 06/25/93
TYPE OF MATERIAL: SOLID

DATE RECEIVED: 06/29/93
DATE COMPLETED: 07/07/93

PARAMETER	REFERENCE METHOD	PRACTICAL QUANTITATION LIMIT	RESULT
PCB's			
PCB's - Aroclor 1016	SW 8080	0.25 mg/kg	BDL mg/kg
PCB's - Aroclor 1221	SW 8080	0.25 mg/kg	BDL mg/kg
PCB's - Aroclor 1232	SW 8080	0.25 mg/kg	BDL mg/kg
PCB's - Aroclor 1242	SW 8080	0.25 mg/kg	BDL mg/kg
PCB's - Aroclor 1248	SW 8080	0.25 mg/kg	2.4 mg/kg
PCB's - Aroclor 1254	SW 8080	0.25 mg/kg	2.3 mg/kg
PCB's - Aroclor 1260	SW 8080	0.25 mg/kg	BDL mg/kg
Total PCB's	SW 8080	0.25 mg/kg	4.7 mg/kg

BDL = BELOW QUANTITATION LIMIT % REC = PERCENT RECOVERY (T) = TOTALS
J = VALUE REPORTED BELOW QUANTITATION LIMIT

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Analytical Services
SAMPLE IDENTIFICATION: 30006688

CUSTOMER IDENTIFICATION: CP-20

PROJECT NUMBER: 6455-107
REPORT NUMBER: 5971
DATE SAMPLED: 06/25/93
TYPE OF MATERIAL: SOLID

DATE RECEIVED: 06/29/93
DATE COMPLETED: 07/07/93

PARAMETER	REFERENCE METHOD	PRACTICAL QUANTITATION LIMIT	RESULT
PCB's			
PCB's - Aroclor 1016	SW 8080	0.25 mg/kg	BDL mg/kg
PCB's - Aroclor 1221	SW 8080	0.25 mg/kg	BDL mg/kg
PCB's - Aroclor 1232	SW 8080	0.25 mg/kg	BDL mg/kg
PCB's - Aroclor 1242	SW 8080	0.25 mg/kg	BDL mg/kg
PCB's - Aroclor 1248	SW 8080	0.25 mg/kg	5.3 mg/kg
PCB's - Aroclor 1254	SW 8080	0.25 mg/kg	7.0 mg/kg
PCB's - Aroclor 1260	SW 8080	0.25 mg/kg	BDL mg/kg
Total PCB's	SW 8080	0.25 mg/kg	12.3 mg/kg

BDL = BELOW QUANTITATION LIMIT % REC = PERCENT RECOVERY (T) = TOTALS
J = VALUE REPORTED BELOW QUANTITATION LIMIT

GREG BECK
KEMRON ENVIRONMENTAL
109 STARLITE PARK
MARIETTA OH 45750

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SAMPLE IDENTIFICATION: 30006689

CUSTOMER IDENTIFICATION: SOIL PILE-20

PROJECT NUMBER: 6455-107
REPORT NUMBER: 5971
DATE SAMPLED: 06/25/93
TYPE OF MATERIAL: SOLID

DATE RECEIVED: 06/29/93
DATE COMPLETED: 07/07/93

PARAMETER	REFERENCE METHOD	PRACTICAL QUANTITATION LIMIT	RESULT
PCB's			
PCB's - Aroclor 1016	SW 8080	0.25 mg/kg	BDL mg/kg
PCB's - Aroclor 1221	SW 8080	0.25 mg/kg	BDL mg/kg
PCB's - Aroclor 1232	SW 8080	0.25 mg/kg	BDL mg/kg
PCB's - Aroclor 1242	SW 8080	0.25 mg/kg	BDL mg/kg
PCB's - Aroclor 1248	SW 8080	0.25 mg/kg	4.7 mg/kg
PCB's - Aroclor 1254	SW 8080	0.25 mg/kg	4.5 mg/kg
PCB's - Aroclor 1260	SW 8080	0.25 mg/kg	BDL mg/kg
Total PCB's	SW 8080	0.25 mg/kg	9.2 mg/kg

BDL = BELOW QUANTITATION LIMIT % REC = PERCENT RECOVERY (T) = TOTALS
J = VALUE REPORTED BELOW QUANTITATION LIMIT

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Analytical Services
SAMPLE IDENTIFICATION: 30006690

CUSTOMER IDENTIFICATION: BACKGROUND OUTSIDE PILE

PROJECT NUMBER: 6455-107
REPORT NUMBER: 5971
DATE SAMPLED: 06/25/93
TYPE OF MATERIAL: SOLID

DATE RECEIVED: 06/29/93
DATE COMPLETED: 07/07/93

PARAMETER	REFERENCE METHOD	PRACTICAL QUANTITATION LIMIT	RESULT
Chloride (ASTM D808)			
Total Chlorides	EPA 300.0	500 mg/kg	500 mg/kg
Inorganic Chlorides	EPA 300.0	100 mg/kg	100 mg/kg
Organic Chlorides	EPA 300.0	500 mg/kg	BDL mg/kg
PCB's			
PCB's - Aroclor 1016	SW 8080	0.25 mg/kg	BDL mg/kg
PCB's - Aroclor 1221	SW 8080	0.25 mg/kg	BDL mg/kg
PCB's - Aroclor 1232	SW 8080	0.25 mg/kg	BDL mg/kg
PCB's - Aroclor 1242	SW 8080	0.25 mg/kg	BDL mg/kg
PCB's - Aroclor 1248	SW 8080	0.25 mg/kg	10.9 mg/kg
PCB's - Aroclor 1254	SW 8080	0.25 mg/kg	15.9 mg/kg
PCB's - Aroclor 1260	SW 8080	0.25 mg/kg	BDL mg/kg
Total PCB's	SW 8080	0.25 mg/kg	26.8 mg/kg

BDL = BELOW QUANTITATION LIMIT % REC = PERCENT RECOVERY (T) = TOTALS
J = VALUE REPORTED BELOW QUANTITATION LIMIT

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SAMPLE IDENTIFICATION: 30006691

CUSTOMER IDENTIFICATION: TP 4 L/N

PROJECT NUMBER: 6455-107
REPORT NUMBER: 5971
DATE SAMPLED: 06/25/93
TYPE OF MATERIAL: WATER

DATE RECEIVED: 06/29/93
DATE COMPLETED: 07/07/93

PARAMETER	REFERENCE METHOD	PRACTICAL QUANTITATION LIMIT	RESULT
PCB's			
PCB'S - Aroclor 1016	SW 8080	10 ug/l	BDL ug/l
PCB'S - Aroclor 1221	SW 8080	10 ug/l	BDL ug/l
PCB'S - Aroclor 1232	SW 8080	10 ug/l	BDL ug/l
PCB'S - Aroclor 1242	SW 8080	10 ug/l	BDL ug/l
PCB'S - Aroclor 1248	SW 8080	10 ug/l	BDL ug/l
PCB'S - Aroclor 1254	SW 8080	10 ug/l	BDL ug/l
PCB'S - Aroclor 1260	SW 8080	10 ug/l	BDL ug/l
TOTAL PCB'S	SW 8080	10 ug/l	BDL ug/l

BDL = BELOW QUANTITATION LIMIT % REC = PERCENT RECOVERY (T) = TOTALS
J = VALUE REPORTED BELOW QUANTITATION LIMIT

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Analytical Services
SAMPLE IDENTIFICATION: 30006692

CUSTOMER IDENTIFICATION: TP 3 L/N

PROJECT NUMBER: 6455-107
REPORT NUMBER: 5971
DATE SAMPLED: 06/25/93
TYPE OF MATERIAL: WATER

DATE RECEIVED: 06/29/93
DATE COMPLETED: 07/07/93

PARAMETER	REFERENCE METHOD	PRACTICAL QUANTITATION LIMIT	RESULT
PCB's			
PCB'S - Aroclor 1016	SW 8080	10 ug/l	BDL ug/l
PCB'S - Aroclor 1221	SW 8080	10 ug/l	BDL ug/l
PCB'S - Aroclor 1232	SW 8080	10 ug/l	BDL ug/l
PCB'S - Aroclor 1242	SW 8080	10 ug/l	BDL ug/l
PCB'S - Aroclor 1248	SW 8080	10 ug/l	BDL ug/l
PCB'S - Aroclor 1254	SW 8080	10 ug/l	BDL ug/l
PCB'S - Aroclor 1260	SW 8080	10 ug/l	BDL ug/l
TOTAL PCB'S	SW 8080	10 ug/l	BDL ug/l

BDL = BELOW QUANTITATION LIMIT % REC = PERCENT RECOVERY (T) = TOTALS
J = VALUE REPORTED BELOW QUANTITATION LIMIT

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SAMPLE IDENTIFICATION: 30006661

CUSTOMER IDENTIFICATION: CP1

PROJECT NUMBER: 6455-107
REPORT NUMBER: 5971
DATE SAMPLED: 06/25/93
TYPE OF MATERIAL: SOLID

DATE RECEIVED: 06/29/93
DATE COMPLETED: 07/07/93

PARAMETER	REFERENCE METHOD	RECOVERY LIMITS (%)	RESULT (%)	
PCB's-Surrogates				
Tetrachloro-m-xylene	SW 8080	48 - 96	43	L

D indicates sample was diluted to a concentration in which surrogates cannot be accurately measured.

Surrogate recoveries flagged as either high (H) or low (L) indicates sample results may be biased either high or low respectively, and the sample results should be considered as estimates.

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SAMPLE IDENTIFICATION: 30006662

CUSTOMER IDENTIFICATION: CP2

PROJECT NUMBER: 6455-107
REPORT NUMBER: 5971
DATE SAMPLED: 06/25/93
TYPE OF MATERIAL: SOLID

DATE RECEIVED: 06/29/93
DATE COMPLETED: 07/07/93

PARAMETER	REFERENCE METHOD	RECOVERY LIMITS (%)	RESULT (%)
PCB's-Surrogates			
Tetrachloro-m-xylene	SW 8080	48 - 96	51

D indicates sample was diluted to a concentration in which surrogates cannot be accurately measured.

Surrogate recoveries flagged as either high (H) or low (L) indicates sample results may be biased either high or low respectively, and the sample results should be considered as estimates.

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SAMPLE IDENTIFICATION: 30006663

CUSTOMER IDENTIFICATION: CP3

PROJECT NUMBER: 6455-107
REPORT NUMBER: 5971
DATE SAMPLED: 06/25/93
TYPE OF MATERIAL: SOLID

DATE RECEIVED: 06/29/93
DATE COMPLETED: 07/07/93

PARAMETER	REFERENCE METHOD	RECOVERY LIMITS (%)	RESULT (%)	
PCB's-Surrogates				
Tetrachloro-m-xylene	SW 8080	48 - 96	44	L

D indicates sample was diluted to a concentration in which surrogates cannot be accurately measured.

Surrogate recoveries flagged as either high (H) or low (L) indicates sample results may be biased either high or low respectively, and the sample results should be considered as estimates.

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SAMPLE IDENTIFICATION: 30006664

CUSTOMER IDENTIFICATION: CP4

PROJECT NUMBER: 6455-107
REPORT NUMBER: 5971
DATE SAMPLED: 06/25/93
TYPE OF MATERIAL: SOLID

DATE RECEIVED: 06/29/93
DATE COMPLETED: 07/07/93

PARAMETER	REFERENCE METHOD	RECOVERY LIMITS (%)	RESULT (%)
PCB's-Surrogates			
Tetrachloro-m-xylene	SW 8080	48 - 96	53

D indicates sample was diluted to a concentration in which surrogates cannot be accurately measured.

Surrogate recoveries flagged as either high (H) or low (L) indicates sample results may be biased either high or low respectively, and the sample results should be considered as estimates.

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SAMPLE IDENTIFICATION: 30006665

CUSTOMER IDENTIFICATION: CP5

PROJECT NUMBER: 6455-107
REPORT NUMBER: 5971
DATE SAMPLED: 06/25/93
TYPE OF MATERIAL: SOLID

DATE RECEIVED: 06/29/93
DATE COMPLETED: 07/07/93

PARAMETER	REFERENCE METHOD	RECOVERY LIMITS (%)	RESULT (%)	
PCB's-Surrogates				
Tetrachloro-m-xylene	SW 8080	48 - 96	41	L

D indicates sample was diluted to a concentration in which surrogates cannot be accurately measured.

Surrogate recoveries flagged as either high (H) or low (L) indicates sample results may be biased either high or low respectively, and the sample results should be considered as estimates.

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SAMPLE IDENTIFICATION: 30006666

CUSTOMER IDENTIFICATION: TP4-1

PROJECT NUMBER: 6455-107
REPORT NUMBER: 5971
DATE SAMPLED: 06/25/93
TYPE OF MATERIAL: SOLID
DATE RECEIVED: 06/29/93
DATE COMPLETED: 07/07/93

PARAMETER	REFERENCE METHOD	RECOVERY LIMITS (%)	RESULT (%)	
PCB's-Surrogates				
Tetrachloro-m-xylene	SW 8080	48 - 96	37	L

D indicates sample was diluted to a concentration in which surrogates cannot be accurately measured.

Surrogate recoveries flagged as either high (H) or low (L) indicates sample results may be biased either high or low respectively, and the sample results should be considered as estimates.

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SAMPLE IDENTIFICATION: 30006667

CUSTOMER IDENTIFICATION: TP4-2

PROJECT NUMBER: 6455-107
REPORT NUMBER: 5971
DATE SAMPLED: 06/25/93
TYPE OF MATERIAL: SOLID

DATE RECEIVED: 06/29/93
DATE COMPLETED: 07/07/93

PARAMETER	REFERENCE METHOD	RECOVERY LIMITS (%)	RESULT (%)	
PCB's-Surrogates				
Tetrachloro-m-xylene	SW 8080	48 - 96	45	L

D indicates sample was diluted to a concentration in which surrogates cannot be accurately measured.

Surrogate recoveries flagged as either high (H) or low (L) indicates sample results may be biased either high or low respectively, and the sample results should be considered as estimates.

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SAMPLE IDENTIFICATION: 30006668

CUSTOMER IDENTIFICATION: TP4-3

PROJECT NUMBER: 6455-107
REPORT NUMBER: 5971
DATE SAMPLED: 06/25/93
TYPE OF MATERIAL: SOLID
DATE RECEIVED: 06/29/93
DATE COMPLETED: 07/07/93

PARAMETER	REFERENCE METHOD	RECOVERY LIMITS (%)	RESULT (%)
PCB's-Surrogates			
Tetrachloro-m-xylene	SW 8080	48 - 96	48

D indicates sample was diluted to a concentration in which surrogates cannot be accurately measured.

Surrogate recoveries flagged as either high (H) or low (L) indicates sample results may be biased either high or low respectively, and the sample results should be considered as estimates.

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SAMPLE IDENTIFICATION: 30006669

CUSTOMER IDENTIFICATION: TP4-4

PROJECT NUMBER: 6455-107
REPORT NUMBER: 5971
DATE SAMPLED: 06/25/93
TYPE OF MATERIAL: SOLID

DATE RECEIVED: 06/29/93
DATE COMPLETED: 07/07/93

PARAMETER	REFERENCE METHOD	RECOVERY LIMITS (%)	RESULT (%)	
PCB's-Surrogates				
Tetrachloro-m-xylene	SW 8080	48 - 96	47	L

D indicates sample was diluted to a concentration in which surrogates cannot be accurately measured.

Surrogate recoveries flagged as either high (H) or low (L) indicates sample results may be biased either high or low respectively, and the sample results should be considered as estimates.

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SAMPLE IDENTIFICATION: 30006670

CUSTOMER IDENTIFICATION: TP4-5

PROJECT NUMBER: 6455-107
REPORT NUMBER: 5971
DATE SAMPLED: 06/25/93
TYPE OF MATERIAL: SOLID

DATE RECEIVED: 06/29/93
DATE COMPLETED: 07/07/93

PARAMETER	REFERENCE METHOD	RECOVERY LIMITS (%)	RESULT (%)
PCB's-Surrogates			
Tetrachloro-m-xylene	SW 8080	48 - 96	35 L

D indicates sample was diluted to a concentration in which surrogates cannot be accurately measured.

Surrogate recoveries flagged as either high (H) or low (L) indicates sample results may be biased either high or low respectively, and the sample results should be considered as estimates.

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SAMPLE IDENTIFICATION: 30006671

CUSTOMER IDENTIFICATION: TP4-WC

PROJECT NUMBER: 6455-107
REPORT NUMBER: 5971
DATE SAMPLED: 06/25/93
TYPE OF MATERIAL: SOLID

DATE RECEIVED: 06/29/93
DATE COMPLETED: 07/07/93

PARAMETER	REFERENCE METHOD	RECOVERY LIMITS (%)	RESULT (%)
PCB's-Surrogates			
Tetrachloro-m-xylene	SW 8080	48 - 96	62

D indicates sample was diluted to a concentration in which surrogates cannot be accurately measured.

Surrogate recoveries flagged as either high (H) or low (L) indicates sample results may be biased either high or low respectively, and the sample results should be considered as estimates.

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SAMPLE IDENTIFICATION: 30006672

CUSTOMER IDENTIFICATION: TP3-1

PROJECT NUMBER: 6455-107
REPORT NUMBER: 5971
DATE SAMPLED: 06/25/93
TYPE OF MATERIAL: SOLID

DATE RECEIVED: 06/29/93
DATE COMPLETED: 07/07/93

PARAMETER	REFERENCE METHOD	RECOVERY LIMITS (%)	RESULT (%)
PCB's-Surrogates			
Tetrachloro-m-xylene	SW 8080	48 - 96	30 L

D indicates sample was diluted to a concentration in which surrogates cannot be accurately measured.

Surrogate recoveries flagged as either high (H) or low (L) indicates sample results may be biased either high or low respectively, and the sample results should be considered as estimates.

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SAMPLE IDENTIFICATION: 30006673

CUSTOMER IDENTIFICATION: TP3-2

PROJECT NUMBER: 6455-107
REPORT NUMBER: 5971
DATE SAMPLED: 06/25/93
TYPE OF MATERIAL: SOLID

DATE RECEIVED: 06/29/93
DATE COMPLETED: 07/07/93

PARAMETER	REFERENCE METHOD	RECOVERY LIMITS (%)	RESULT (%)	
PCB's-Surrogates				
Tetrachloro-m-xylene	SW 8080	48 - 96	35	L

D indicates sample was diluted to a concentration in which surrogates cannot be accurately measured.

Surrogate recoveries flagged as either high (H) or low (L) indicates sample results may be biased either high or low respectively, and the sample results should be considered as estimates.

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SAMPLE IDENTIFICATION: 30006674

CUSTOMER IDENTIFICATION: TP3-3

PROJECT NUMBER: 6455-107
REPORT NUMBER: 5971
DATE SAMPLED: 06/25/93
TYPE OF MATERIAL: SOLID
DATE RECEIVED: 06/29/93
DATE COMPLETED: 07/07/93

PARAMETER	REFERENCE METHOD	RECOVERY LIMITS (%)	RESULT (%)
PCB's-Surrogates			
Tetrachloro-m-xylene	SW 8080	48 - 96	57

D indicates sample was diluted to a concentration in which surrogates cannot be accurately measured.

Surrogate recoveries flagged as either high (H) or low (L) indicates sample results may be biased either high or low respectively, and the sample results should be considered as estimates.

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SAMPLE IDENTIFICATION: 30006675

CUSTOMER IDENTIFICATION: TP3-4

PROJECT NUMBER: 6455-107
REPORT NUMBER: 5971
DATE SAMPLED: 06/25/93
TYPE OF MATERIAL: SOLID

DATE RECEIVED: 06/29/93
DATE COMPLETED: 07/07/93

PARAMETER	REFERENCE METHOD	RECOVERY LIMITS (%)	RESULT (%)
PCB's-Surrogates			
Tetrachloro-m-xylene	SW 8080	48 - 96	57

D indicates sample was diluted to a concentration in which surrogates cannot be accurately measured.

Surrogate recoveries flagged as either high (H) or low (L) indicates sample results may be biased either high or low respectively, and the sample results should be considered as estimates.

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SAMPLE IDENTIFICATION: 30006676

CUSTOMER IDENTIFICATION: TP3-5

PROJECT NUMBER: 6455-107
REPORT NUMBER: 5971
DATE SAMPLED: 06/25/93
TYPE OF MATERIAL: SOLID

DATE RECEIVED: 06/29/93
DATE COMPLETED: 07/07/93

PARAMETER	REFERENCE METHOD	RECOVERY LIMITS (%)	RESULT (%)
PCB's-Surrogates			
Tetrachloro-m-xylene	SW 8080	48 - 96	54

D indicates sample was diluted to a concentration in which surrogates cannot be accurately measured.

Surrogate recoveries flagged as either high (H) or low (L) indicates sample results may be biased either high or low respectively, and the sample results should be considered as estimates.

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SAMPLE IDENTIFICATION: 30006677

CUSTOMER IDENTIFICATION: TP3-WC

PROJECT NUMBER: 6455-107
REPORT NUMBER: 5971
DATE SAMPLED: 06/25/93
TYPE OF MATERIAL: SOLID

DATE RECEIVED: 06/29/93
DATE COMPLETED: 07/07/93

PARAMETER	REFERENCE METHOD	RECOVERY LIMITS (%)	RESULT (%)
PCB's-Surrogates			
Tetrachloro-m-xylene	SW 8080	48 - 96	77

D indicates sample was diluted to a concentration in which surrogates cannot be accurately measured.

Surrogate recoveries flagged as either high (H) or low (L) indicates sample results may be biased either high or low respectively, and the sample results should be considered as estimates.

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Analytical Services
SAMPLE IDENTIFICATION: 30006678

CUSTOMER IDENTIFICATION: TP5,1,12"

PROJECT NUMBER: 6455-107
REPORT NUMBER: 5971
DATE SAMPLED: 06/25/93
TYPE OF MATERIAL: SOLID
DATE RECEIVED: 06/29/93
DATE COMPLETED: 07/07/93

PARAMETER	REFERENCE METHOD	RECOVERY LIMITS (%)	RESULT (%)
PCB's-Surrogates			
Tetrachloro-m-xylene	SW 8080	48 - 96	74

D indicates sample was diluted to a concentration in which surrogates cannot be accurately measured.

Surrogate recoveries flagged as either high (H) or low (L) indicates sample results may be biased either high or low respectively, and the sample results should be considered as estimates.

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SAMPLE IDENTIFICATION: 30006679

CUSTOMER IDENTIFICATION: TP5,1,24"

PROJECT NUMBER: 6455-107
REPORT NUMBER: 5971
DATE SAMPLED: 06/25/93
TYPE OF MATERIAL: SOLID

DATE RECEIVED: 06/29/93
DATE COMPLETED: 07/07/93

PARAMETER	REFERENCE METHOD	RECOVERY LIMITS (%)	RESULT (%)	
PCB's-Surrogates				
Tetrachloro-m-xylene	SW 8080	48 - 96	38	L

D indicates sample was diluted to a concentration in which surrogates cannot be accurately measured.

Surrogate recoveries flagged as either high (H) or low (L) indicates sample results may be biased either high or low respectively, and the sample results should be considered as estimates.

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109 STARLITE PARK
MARIETTA OH 45750

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Analytical Services
SAMPLE IDENTIFICATION: 30006680

CUSTOMER IDENTIFICATION: TP5,2,12"

PROJECT NUMBER: 6455-107
REPORT NUMBER: 5971
DATE SAMPLED: 06/25/93
TYPE OF MATERIAL: SOLID

DATE RECEIVED: 06/29/93
DATE COMPLETED: 07/07/93

PARAMETER	REFERENCE METHOD	RECOVERY LIMITS (%)	RESULT (%)	
PCB's-Surrogates				
Tetrachloro-m-xylene	SW 8080	48 - 96	32	L

D indicates sample was diluted to a concentration in which surrogates cannot be accurately measured.

Surrogate recoveries flagged as either high (H) or low (L) indicates sample results may be biased either high or low respectively, and the sample results should be considered as estimates.

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SAMPLE IDENTIFICATION: 30006681

CUSTOMER IDENTIFICATION: TP5,2,24"

PROJECT NUMBER: 6455-107
REPORT NUMBER: 5971
DATE SAMPLED: 06/25/93
TYPE OF MATERIAL: SOLID

DATE RECEIVED: 06/29/93
DATE COMPLETED: 07/07/93

PARAMETER	REFERENCE METHOD	RECOVERY LIMITS (%)	RESULT (%)	
PCB's-Surrogates				
Tetrachloro-m-xylene	SW 8080	48 - 96	30	L

D indicates sample was diluted to a concentration in which surrogates cannot be accurately measured.

Surrogate recoveries flagged as either high (H) or low (L) indicates sample results may be biased either high or low respectively, and the sample results should be considered as estimates.

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SAMPLE IDENTIFICATION: 30006682

CUSTOMER IDENTIFICATION: TP5,3,12"

PROJECT NUMBER: 6455-107
REPORT NUMBER: 5971
DATE SAMPLED: 06/25/93
TYPE OF MATERIAL: SOLID
DATE RECEIVED: 06/29/93
DATE COMPLETED: 07/07/93

PARAMETER	REFERENCE METHOD	RECOVERY LIMITS (%)	RESULT (%)	
PCB's-Surrogates				
Tetrachloro-m-xylene	SW 8080	48 - 96	30	L

D indicates sample was diluted to a concentration in which surrogates cannot be accurately measured.

Surrogate recoveries flagged as either high (H) or low (L) indicates sample results may be biased either high or low respectively, and the sample results should be considered as estimates.

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Analytical Services
SAMPLE IDENTIFICATION: 30006683

CUSTOMER IDENTIFICATION: TP5,3,24"

PROJECT NUMBER: 6455-107
REPORT NUMBER: 5971
DATE SAMPLED: 06/25/93
TYPE OF MATERIAL: SOLID

DATE RECEIVED: 06/29/93
DATE COMPLETED: 07/07/93

PARAMETER	REFERENCE METHOD	RECOVERY LIMITS (%)	RESULT (%)	
PCB's-Surrogates				
Tetrachloro-m-xylene	SW 8080	48 - 96	35	L

D indicates sample was diluted to a concentration in which surrogates cannot be accurately measured.

Surrogate recoveries flagged as either high (H) or low (L) indicates sample results may be biased either high or low respectively, and the sample results should be considered as estimates.

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KEMRON ENVIRONMENTAL
109 STARLITE PARK
MARIETTA OH 45750

USPCI
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Union Pacific Corporation

Analytical Services

SAMPLE IDENTIFICATION: 30006684

CUSTOMER IDENTIFICATION: TP-I 20

PROJECT NUMBER: 6455-107
REPORT NUMBER: 5971
DATE SAMPLED: 06/25/93
TYPE OF MATERIAL: SOLID

DATE RECEIVED: 06/29/93
DATE COMPLETED: 07/07/93

PARAMETER	REFERENCE METHOD	RECOVERY LIMITS (%)	RESULT (%)	
PCB's-Surrogates				
Tetrachloro-m-xylene	SW 8080	48 - 96	36	L

D indicates sample was diluted to a concentration in which surrogates cannot be accurately measured.

Surrogate recoveries flagged as either high (H) or low (L) indicates sample results may be biased either high or low respectively, and the sample results should be considered as estimates.

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SAMPLE IDENTIFICATION: 30006685

CUSTOMER IDENTIFICATION: TP-II 20

PROJECT NUMBER: 6455-107
REPORT NUMBER: 5971
DATE SAMPLED: 06/25/93
TYPE OF MATERIAL: SOLID

DATE RECEIVED: 06/29/93
DATE COMPLETED: 07/07/93

PARAMETER	REFERENCE METHOD	RECOVERY LIMITS (%)	RESULT (%)	
PCB's-Surrogates				
Tetrachloro-m-xylene	SW 8080	48 - 96	41	L

D indicates sample was diluted to a concentration in which surrogates cannot be accurately measured.

Surrogate recoveries flagged as either high (H) or low (L) indicates sample results may be biased either high or low respectively, and the sample results should be considered as estimates.

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SAMPLE IDENTIFICATION: 30006686

CUSTOMER IDENTIFICATION: TP-III 20

PROJECT NUMBER: 6455-107
REPORT NUMBER: 5971
DATE SAMPLED: 06/25/93
TYPE OF MATERIAL: SOLID
DATE RECEIVED: 06/29/93
DATE COMPLETED: 07/07/93

PARAMETER	REFERENCE METHOD	RECOVERY LIMITS (%)	RESULT (%)	
PCB's-Surrogates				
Tetrachloro-m-xylene	SW 8080	48 - 96	43	L

D indicates sample was diluted to a concentration in which surrogates cannot be accurately measured.

Surrogate recoveries flagged as either high (H) or low (L) indicates sample results may be biased either high or low respectively, and the sample results should be considered as estimates.

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SAMPLE IDENTIFICATION: 30006687

CUSTOMER IDENTIFICATION: TP-IV 20

PROJECT NUMBER: 6455-107
REPORT NUMBER: 5971
DATE SAMPLED: 06/25/93
TYPE OF MATERIAL: SOLID

DATE RECEIVED: 06/29/93
DATE COMPLETED: 07/07/93

PARAMETER	REFERENCE METHOD	RECOVERY LIMITS (%)	RESULT (%)	
PCB's-Surrogates				
Tetrachloro-m-xylene	SW 8080	48 - 96	41	L

D indicates sample was diluted to a concentration in which surrogates cannot be accurately measured.

Surrogate recoveries flagged as either high (H) or low (L) indicates sample results may be biased either high or low respectively, and the sample results should be considered as estimates.

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SAMPLE IDENTIFICATION: 30006688

CUSTOMER IDENTIFICATION: CP-20

PROJECT NUMBER: 6455-107
REPORT NUMBER: 5971
DATE SAMPLED: 06/25/93
TYPE OF MATERIAL: SOLID

DATE RECEIVED: 06/29/93
DATE COMPLETED: 07/07/93

PARAMETER	REFERENCE METHOD	RECOVERY LIMITS (%)	RESULT (%)
PCB's-Surrogates			
Tetrachloro-m-xylene	SW 8080	48 - 96	62

D indicates sample was diluted to a concentration in which surrogates cannot be accurately measured.

Surrogate recoveries flagged as either high (H) or low (L) indicates sample results may be biased either high or low respectively, and the sample results should be considered as estimates.

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SAMPLE IDENTIFICATION: 30006689

CUSTOMER IDENTIFICATION: SOIL PILE-20

PROJECT NUMBER: 6455-107
REPORT NUMBER: 5971
DATE SAMPLED: 06/25/93
TYPE OF MATERIAL: SOLID
DATE RECEIVED: 06/29/93
DATE COMPLETED: 07/07/93

PARAMETER	REFERENCE METHOD	RECOVERY LIMITS (%)	RESULT (%)
PCB's-Surrogates			
Tetrachloro-m-xylene	SW 8080	48 - 96	52

D indicates sample was diluted to a concentration in which surrogates cannot be accurately measured.

Surrogate recoveries flagged as either high (H) or low (L) indicates sample results may be biased either high or low respectively, and the sample results should be considered as estimates.

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SAMPLE IDENTIFICATION: 30006690

CUSTOMER IDENTIFICATION: BACKGROUND OUTSIDE PILE

PROJECT NUMBER: 6455-107
REPORT NUMBER: 5971
DATE SAMPLED: 06/25/93
TYPE OF MATERIAL: SOLID
DATE RECEIVED: 06/29/93
DATE COMPLETED: 07/07/93

PARAMETER	REFERENCE METHOD	RECOVERY LIMITS (%)	RESULT (%)
PCB's-Surrogates			
Tetrachloro-m-xylene	SW 8080	48 - 96	69

D indicates sample was diluted to a concentration in which surrogates cannot be accurately measured.

Surrogate recoveries flagged as either high (H) or low (L) indicates sample results may be biased either high or low respectively, and the sample results should be considered as estimates.

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SAMPLE IDENTIFICATION: 30006691

CUSTOMER IDENTIFICATION: TP 4 L/N

PROJECT NUMBER: 6455-107
REPORT NUMBER: 5971
DATE SAMPLED: 06/25/93
TYPE OF MATERIAL: WATER

DATE RECEIVED: 06/29/93
DATE COMPLETED: 07/07/93

PARAMETER	REFERENCE METHOD	RECOVERY LIMITS (%)	RESULT (%)
PCB's-Surrogates			
Tetrachloro-m-xylene	SW 8080	48 - 96	69

D indicates sample was diluted to a concentration in which surrogates cannot be accurately measured.

Surrogate recoveries flagged as either high (H) or low (L) indicates sample results may be biased either high or low respectively, and the sample results should be considered as estimates.

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SAMPLE IDENTIFICATION: 30006692

CUSTOMER IDENTIFICATION: TP 3 L/N

PROJECT NUMBER: 6455-107
REPORT NUMBER: 5971
DATE SAMPLED: 06/25/93
TYPE OF MATERIAL: WATER

DATE RECEIVED: 06/29/93
DATE COMPLETED: 07/07/93

PARAMETER	REFERENCE METHOD	RECOVERY LIMITS (%)	RESULT (%)
PCB's-Surrogates			
Tetrachloro-m-xylene	SW 8080	48 - 96	65

D indicates sample was diluted to a concentration in which surrogates cannot be accurately measured.

Surrogate recoveries flagged as either high (H) or low (L) indicates sample results may be biased either high or low respectively, and the sample results should be considered as estimates.

ENVIRONMENTAL SERVICES

CHAIN-OF-CUSTODY RECORD

No 57104

Page 1 of 1

Project Contact: Greg Beck / Art Gray

Turn Around Requirements: 5 Days

Project No.: 6455-107 | Project Name: Columbus Scrap

Sampler (print): Kevin Orelstreet | Signature:

Sample I.D. No.	Comp*	Grab	Date	Time	Protocol CWA	Protocol SW846	NUMBER OF SAMPLES	Hold	PCB 8080 meth. D	ADDITIONAL REQUIREMENTS
CP 1	Comp	X	6/25/93				1		X	936661
CP 2		X	"				1		X	936662
CP 3		X	"				1		X	936663
CP 4		X	"				1		X	936664
CP 5		X	6/25/93				1		X	936665
TP 4-1		X	"				1		X	936666
TP 4-2		X	"				1		X	936667
TP 4-3		X	"				1		X	936668
TP 4-4		X	"				1		X	936669
TP 4-5		X	"				1		X	936670
TP 4-WC	X		"				1		X	936671
TP 3-1		X	"				1		X	936672
TP 3-2		X	"				1		X	936673
TP 3-3		X	"				1		X	936674
TP 3-4		X	"				1		X	936675
TP 3-5		X	"				1		X	936676
TP 3-WC	X		6/25/93				1		X	936677

Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Relinquished by: (Signature)	Date	Time	Received by: (Signature)
Kevin Orelstreet	6/25/93	1722					

Relinquished by: (Signature)	Date	Time	Received for Laboratory by: (Signature)	Date	Time	Remarks:
				6/29/93	1030 A	Samples stored in Locked Cooler overnight

*Homogenize all composite samples prior to analysis

White – Lab Yellow – Office Pink – Field

APPENDIX F

TAT LETTER TO U.S. EPA

ecology and environment, inc.
6777 ENGLE ROAD, CLEVELAND, OHIO 44130, TEL. (216) 243-3330
International Specialists in the Environment

M E M O R A N D U M

TO: Steve Renninger, OSC, U.S. EPA, Westlake, Ohio

FROM: Nazeer Uddin, TAT, E & E, Cleveland, Ohio

DATE: January 12, 1994

SUBJECT: Comments over Work Plan for Remediation of PCB-Contaminated Soils at Columbus Scrap Site

* Executive Summary, Paragraph 1, Line 4, Mention the highest concentration of PCBs.

* Page 10, Sec. 3.3.4, Line 9 is contradicting the sentence in the Executive summary, Page 2, line 1.

* Page 2, Section 1.2.2, Mention the highest concentration of PCB in the composite soil samples.

* Page 4, sec. 1.2.6, Mention results of the verification samples.

* Page 4, Sec. 1.2.8, Line 2, Mention the evaluation results of the microbial PCB degradation, present the laboratory data.

* Page 4 Section 1.2.8, Line 7, If degradation could not be confirmed in the field test, then should a full scale bioremediation be conducted ?

* Page 8, Sec. 3.0, Proposed Activities,

The PRP-proposed sampling plan is inadequate. The sample spacing is too sparse, allowing too high of a probability that sample results will be unrepresentative and that significant "hot spots" will be undetected. More significantly, there is also a high probability that a "cold spot" will be encountered occasionally, resulting in misclassification and underestimation of the environmental threat posed by a particular subgrouping of the soil pile.

* PRP Proposal

The PRP wishes to subdivide a 16,000 cubic yard soil pile into approximately 168 subgroups and segregate the subgroups based upon the mean PCB concentration rages of each subgroup "low" (0-10 mg/kg), "medium" (10-100 mg/kg), and "high" (>100 mg/kg). The low soils are to be placed back on site with no further treatment. The medium soils will be bioremediated on-site and the high soils will be further subdivided into five equal volumes, resampled and resegregated. Soils found to be greater than 100 mg/kg after the second sampling will be sent off-site for disposal.

The PRP proposed to subdivide the soil pile into 168 subgroups of approximately 100 cubic yards each. The dimensions of each subgroup is approximately 38 x 38 x 2 ft. The PRP proposes to characterize each subgroup by collecting and analyzing a single grab sample from the geometric center of the subgroup.

* Evaluation of the Work Plan,

It is unclear why the PRP would suspect that the true mean concentration of any soil pile subgroup would fail to exceed 10 mg/kg. The pile was derived from soils found by sampling to exceed 25 mg/kg plus a slight buffer volume between "the last interval exceeding the PCB target level and the first underlying clean sample interval" (page 4 para. 1). However, it seems unlikely that the relative volume of buffer soil is large enough to dilute the mean soil concentration of any subgroup below 10 mg/kg and even less likely that it was deposited systematically in 38 x 38 x 2 ft. chunks. The potential contaminant reduction via unintentional in-situ bioremediation is sufficient reason to sort through the pile at this time. Whether intentionally or unintentionally, the PRP is proposing to reduce disposal volume by taking advantage of statistical false negatives e.g. there is a definite probability that, through the use of an unrepresentative sampling strategy, occasionally a "cold spot" will be encountered, resulting in a lower than actual (false negative) result.

* Further analysis of the proposed sampling strategy is as follows:

With a rectangular grid spacing of 38 x 38 ft, there is an approximately 72% probability that a circular hot spot with a 10 ft. radius (20 ft diameter) will be missed and an approximate 97% chance that a hot spot with a 5 ft. radius will be missed (U.S. EPA 1991 p. 10). To attain a 94% probability of hitting a hot spot of 10 ft. radius, grid spacing would have to be reduced to approximately 17 x 17 ft. To attain a 94% probability of hitting a hot spot of 5 ft. radius, grid spacing would have to be reduced to approximately 8 x 8 ft.

* Unless the soil pile is quite homogeneous, the geostatistical

relationship between adjacent sample points using a grid spacing as large as 38 x 38 ft. would be expected to be negligible. If there is not relationship between points, then there is no added confidence in the fact that approximately 168 samples are being collected. Rather, each data point is being expected to stand alone and support the decision as to which category a particular 38 x 38 x 2 ft. subgroup belongs.

* Typically in the removal program, a compositing strategy of 7 to 9 equally-spaced aliquot would be employed within an area as large as 38 x 38 ft (instead of a single-point grab sample). The selection of grid spacings vary depending upon the suspected size of the area of contamination, the suspected rate of change in contaminant concentration with respect to X-Y coordinates, and a balancing of the cost of sampling versus the hazard posed by missing an area of contamination of a given size. Since the removal program is charged primarily with removing immediate threats, it is not always necessary to achieve the statistical levels of confidence typical in the remedial program, especially during the assessment phase. However, once the presence and extent of contamination has been determined and clean-up levels have been established, it is very appropriate to require higher levels of confidence.

* The TSCA program has promulgate a very formal procedure for sampling soils contaminated with PCBs via spills under their jurisdiction. The procedure requires a 37-pt. hexagonal array of sampling points for areas as large as 38 x 38 ft. (U.S. EPA 1985). The procedure allows compositing of the 37 aliquot into as few as four composite samples in order to conserve cost. However, in order to insure the attainment of cleanup levels at each sampling point, the procedure requires a requisite reduction in the action level in inverse proportion to the number of aliquot per sample. A working maximum of 10 aliquot per sample has also been established by the procedure. Using this approach, the probability of finding a hot spot with a 10 ft. radius is 100%. Even if the contamination is distributed, using Monte Carlo calculations, the probability of finding a 15 ppm hot spot is greater than 86% if the area of contamination has an equivalent radius of 10 ft. within a 38 X 38 ft. grid. The probability would be approximately 74% if the area of contamination has an equivalent radius of 5 ft. (U.S. EPA 1985).

* In order to insure that the environmental data for this project is of known quality, the PRP should be required to meet the sampling quality assurance requirements for Removal Program Data Quality Objective (DQO) level 2 (QA2) as delineated in the Removal Program Guidance document (U.S. EPA 1990). These requirements must include the generation of an analytical data package which includes initial and continuing calibration, chromatograms, blanks, spikes, etc. At least 10% of the data should be validated per Removal Program Guidelines.

* Alternative: A nonparametric statistical approach could be employed to demonstrate to a high confidence limit that the absolute concentration of PCBs within a large percentage of the entire soil pile (90% or better) does not exceed a prescribed limit. Classical statistics could be employed to insure the mean concentration of the entire pile does not exceed the action level.

An outline of the alternative approach is as follows:

o If the PRP agrees to abandon attempts to subdivide and segregate soil volumes, it is reasonable to suppose that the vast majority (say 90% or more) of the PCB contamination within the soil pile volume does not exceed 100 mg/kg and the mean concentration of the entire pile is low (less than 50 mg/kg). If true, bioremediation of the entire pile could reasonably be expected to reduce both the overall mean concentration and the absolute concentration of over 90% of the pile volume to less than 25 mg/kg within one year.

o Both assumptions can be proven statistically using the nonparametric approach. The supposition that the PCB concentration within at least 90% of the soil pile volume does not exceed 100 mg/kg can be proven to a 95% confidence limit by sampling as few as 29 randomly selected locations within the soil pile (see attached table). If none of the samples exceed 100 mg/kg, then the supposition is proven. If 103 randomly selected samples are collected, as many as 5 samples could be found to exceed 100 mg/kg and the supposition (than 90% of the soil volume does not exceed 100 mg/kg) is still proven. A statistically acceptable mean soil concentration for the entire pile can also be derived from the 103 samples.

Subsequently, after treatment, a similar number of randomly selected samples can be taken and analyzed to prove that both the overall mean concentration and the absolute concentration of over 90% of the soil volume has been reduced below the action level of 25 mg/kg.

By using the nonparametric approach, costs are conserved and statistical confidence is attained. However, the PRP should not assume it can easily reinterpret the data and return to the segregation strategy if the initial assumption is disproven (i.e. if the total number of samples is 103 and the number of exceedances is greater than five). The PRP could hedge its bets by collecting each of the 103 soil samples as a composite around a cartesian coordinate grid node (randomly selected).

Collecting composite samples would entail greater labor costs but the option of returning to a segregation strategy would be somewhat preserved thereby.

C_h Cost of collecting, processing, and analyzing one additional soil sample, on a relative scale.

L The number of strata.

y_{hi} The scored concentration data, where $y_{hi} = 1$ if the measured concentration is greater than the cleanup standard and 0 otherwise.

Table 7.1 Selected information from Tables A.7 - A.9 that can be used to determine the sample sizes required for zero or few exceedance rules associated with various levels of statistical performance and degrees of cleanup

Chance of Saying the Site is Clean When It is Dirty (Certainty)	Proportion of the Site That Is Clean	Sample Size Requirements Under Various Numbers of Allowed Exceedances of the Cleanup Standard			
False Positive Rate, Alpha (1 - Alpha)	1-P0	Number of Allowed Exceedances 0	1	3	5
.01	.99	459	662	1001	1307
(.99)	.95	90	130	198	259
	.90	44	64	97	127
.05	.99	299	473	773	1049
(.95)	.95	59	93	153	208
	.90	29	46	76	103
.10	.99	230	388	667	926
(.90)	.95	45	77	132	184
	.90	22	38	65	91

Source: Methods for Evaluating the Attainment of Cleanup Standards EPA 230/02-89/042

(8)

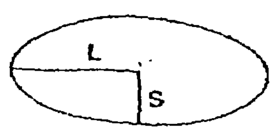
Table 1: Probability of Missing an Elliptical Hot Spot

LENGTH OF SHORT AXIS AS A PERCENTAGE OF GRID SPACING (columns); LENGTH OF LONG AXIS AS A PERCENTAGE OF GRID SPACING (rows)

	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
10%	0.97 / 0.95									
20%	0.95 / 0.92	0.88 / 0.85								
30%	0.92 / 0.87	0.83 / 0.78	0.72 / 0.66							
40%	0.88 / 0.85	0.75 / 0.71	0.65 / 0.55	0.50 / 0.41						
50%	0.85 / 0.82	0.69 / 0.63	0.54 / 0.44	0.38 / 0.27	0.21 / 0.08					
60%	0.80 / 0.80	0.62 / 0.58	0.45 / 0.35	0.27 / 0.15	0.12 / 0.03	0.06 / 0.0				
70%	0.77 / 0.77	0.56 / 0.54	0.38 / 0.29	0.18 / 0.12	0.07 / 0.01	0.03 / 0.0	0.0 / 0.0			
80%	0.75 / 0.75	0.54 / 0.50	0.32 / 0.23	0.12 / 0.08	0.05 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0		
90%	0.72 / 0.72	0.51 / 0.45	0.30 / 0.21	0.10 / 0.06	0.03 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	
100%	0.70 / 0.66	0.45 / 0.37	0.24 / 0.18	0.08 / 0.04	0.01 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0

From tables in: Gilbert, 1987

L = length of long axis
S = length of short axis



Key: upper-left value = BLOCK GRID (e.g. 0.97); lower-right value = TRIANGULAR GRID (e.g. 0.95)

From: Removal Program Representative Sampling Guidance.